

Custom Subnet Masks

Problem 7

Number of needed subnets **2000**
 Number of needed usable hosts **15**
 Network Address **178.100.0.0**

Address class B

Default subnet mask 255.255.0.0

Custom subnet mask 255.255.255.224

Total number of subnets 2,048

Total number of host addresses 32

Number of usable addresses 30

Number of bits borrowed 11

Show your work for Problem 7 in the space below.

Number of Hosts	65,536	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2
Number of Subnets	2	4	8	16	32	64	128	256	512	1,024	2,048	4,096	8,192	16,384	32,768	65,536
Binary values	128	64	32	16	8	4	2	1	128	64	32	16	8	4	2	1
178 . 100 . 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Custom subnet = 128
 64
 32
 16
 8
 4
 2
 1

 255 . 224

Usable addresses
 32
 - 2

 30

Usable subnets
 2,048
 - 2

 2,046

Custom Subnet Masks

Problem 15

Number of needed usable hosts 50

Network Address 172.59.0.0

Address class B

Default subnet mask 255.255.0.0

Custom subnet mask ~~1,024~~ 255.255.255.192

Total number of subnets ~~24~~ 1,024

Total number of host addresses ~~64~~ 64

Number of usable addresses 462

Number of bits borrowed 10

Show your work for Problem 15 in the space below.

Number of Hosts	Number of Subnets	Binary Values
65,536	2	172.59.0
32,768	4	0
16,384	8	0
8,192	16	0
4,096	32	0
2,048	64	0
1,024	128	0
512	256	0
256	512	0
128	1024	0
64	2048	0
32	4096	0
16	8192	0
8	16384	0
4	32768	0
2	65536	0

Usable subnets = $1024 - 2$

1022

$$\begin{array}{r} \text{Usable Hosts } 64 \\ - 2 \\ \hline 62 \end{array}$$

Custom subnet mask = 728
64
32
16
4

$$\begin{array}{r} 2 \\ 1 \\ \hline 255 \end{array} \cdot \begin{array}{r} 128 \\ 64 \\ \hline 192 \end{array}$$

Subnetting

Problem 11

Number of needed usable hosts **8,000**

Network Address **135.70.0.0**

Address class B

Default subnet mask 255.255.0.0

Custom subnet mask 255.255.224.0

Total number of subnets 8

Total number of host addresses 8,192

Number of usable addresses 8,190

Number of bits borrowed 3

What is the 6th subnet range? 135.70.160.0 to 135.70.191.255

What is the subnet number for the 7th subnet? 135.70.192.0

What is the subnet broadcast address for the 3rd subnet? 135.70.95.255

What are the assignable addresses for the 5th subnet? 135.70.128.1 to 135.70.159.254

Show your work for Problem 11 in the space below.

Number of Hosts	Number of Subnets	Binary	to	Useable addresses
135	70	00000000	135.70.0.0	8,190
		(0) 0000	135.70.0.0	
		(1) 0001	135.70.32.0	
		(2) 0010	135.70.64.0	
		(3) 0011	135.70.96.0	
		(4) 0100	135.70.128.0	
		(5) 0101	135.70.160.0	
		(6) 0110	135.70.192.0	
		(7) 0111	135.70.224.0	

Useable addresses = $8,192 - 2 = 8,190$

Custom subnet mask = $129 - 64 = 65$

Subnetting

Problem 12

Number of needed usable hosts **45**

Network Address **198.125.50.0**

Address class C

Default subnet mask 255.255.255.0

Custom subnet mask 255.255.255.192

Total number of subnets 4

Total number of host addresses 64

Number of usable addresses 62

Number of bits borrowed 2

What is the 2nd subnet range? 198.125.50.64 to 198.125.50.127

What is the subnet number for the 2nd subnet? 198.125.50.64

What is the subnet broadcast address for the 4th subnet? 198.125.50.255

What are the assignable addresses for the 3rd subnet? 198.125.50.128 to 198.125.50.190

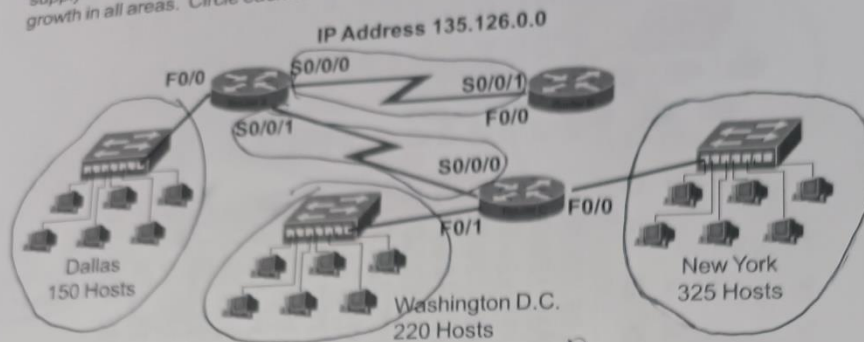
Show your work for Problem 12 in the space below.

Number of Hosts - 256	128	64	32	16	8	4	2
Number of Subnets - 2	4	8	16	32	64	128	256
Borrowing - 128	64	32	16	8	4	2	1
198.125.50.0	0	0	0	0	0	0	0
(0)	0	198.125.50.0	to	198.125.50.63			
(1)	1				.64		127
(2)	1 0				.128		191
(3)	1 1				.192	to	198.125.50.255

Subnet Mask = 128		Usable hosts 64
64		- 2
192		<hr/> 62

Practical Subnetting 4

Based on the information in the graphic shown, design a network addressing scheme that will supply the minimum number of subnets, and allow enough extra subnets and hosts for 70% growth in all areas. Circle each subnet on the graphic and answer the questions below.



Address class B

Custom subnet mask 255.255.240.0

Minimum number of subnets needed 5

Extra subnets required for 70% growth + 4
(Round up to the next whole number)

Total number of subnets needed = 9

Number of host addresses in the largest subnet group 325

Number of addresses needed for 70% growth in the largest subnet + 228
(Round up to the next whole number)

Total number of address needed for the largest subnet = 553

Start with the first subnet and arrange your sub-networks from the largest group to the smallest.

IP address range for New York 135.126.0.0 to 135.126.15.255

IP address range for Washington D. C. 135.126.16.0 to 135.126.31.255

IP address range for Dallas 135.126.32.0 to 135.126.47.255

IP address range for Router A to Router B serial connection 135.126.48.0 to 135.126.63.255

IP address range for Router A to Router C serial connection 135.126.64.0 to 135.126.79.255

Show your work for Problem 4 in the space below.

Hosts	Subnets	Binary	135.126.0.0	135.126.15.255
8,192	1	16	135.126.0.0	135.126.15.255
4,096	2	8	135.126.0.0	135.126.15.255
2,048	4	4	135.126.0.0	135.126.15.255
1,024	8	2	135.126.0.0	135.126.15.255
512	16	1	135.126.0.0	135.126.15.255
256	32	0	135.126.0.0	135.126.15.255
128	64	0	135.126.0.0	135.126.15.255
64	128	0	135.126.0.0	135.126.15.255
32	256	0	135.126.0.0	135.126.15.255
16	512	0	135.126.0.0	135.126.15.255
8	1,024	0	135.126.0.0	135.126.15.255
4	2,048	0	135.126.0.0	135.126.15.255
2	4,096	0	135.126.0.0	135.126.15.255
1	8,192	0	135.126.0.0	135.126.15.255

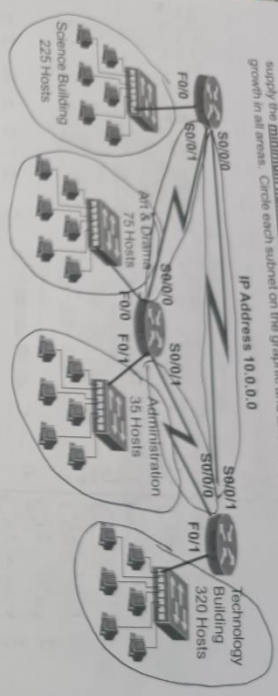
11 = same as above

(0)	0
(1)	1
(2)	1 0
(3)	1 1
(4)	1 0 0
(5)	1 0 1
(6)	1 1 0
(7)	1 1 1
(8)	1 0 0 0
(9)	1 0 0 1
(10)	1 0 1 0
(11)	1 0 1 1
(12)	1 1 0 0
(13)	1 1 0 1
(14)	1 1 1 0

135.126.240.0
to
135.126.255.255

Practical Subnetting 6

Based on the information in the graphic shown, design a network addressing scheme that will supply the minimum number of subnets, and allow enough extra subnets and hosts for 20% growth in all areas. Circle each subnet on the graphic and answer the questions below.



Address class A
Custom subnet mask 255.240.0.0

Minimum number of subnets needed 7
Extra subnets required for 20% growth + 2
(Round up to the next whole number)
Total number of subnets needed = 9

Start with the first subnet and arrange your sub-networks from the largest group to the smallest.

- IP address range for Technology 10.0.0.0 to 10.15.255.255
- IP address range for Science 10.16.0.0 to 10.31.255.255
- IP address range for Arts & Drama 10.32.0.0 to 10.47.255.255
- IP Address range Administration 10.48.0.0 to 10.63.255.255
- IP address range for Router A to Router B serial connection 10.64.0.0 to 10.79.255.255
- IP address range for Router A to Router C serial connection 10.80.0.0 to 10.95.255.255
- IP address range for Router B to Router C serial connection 10.96.0.0 to 10.111.255.255

		Subnets - 2 4 8 16				Binary - 128 64 32 16				32 64 128 256 512 1024 2048 4096 8192 16384 32768 65536 131072 262144 524288 1048576 2097152 4194304 8388608 16777216 33554432 67108864 134217728 268435456 536870912 1073741824 2147483648 4294967296 8589934592 17179869184 34359738368 68719476736 137438953472 274877906944 549755813888 1099511627776 2199023255552 4398046511104 8796093022208 17592186044416 35184372088832 70368744177664 140737488355328 281474976710656 562949953421312 1125899906842624 2251799813685248 4503599627370496 9007199254740992 18014398509481984 36028797018963968 72057594037927936 144115188075855872 288230376151711744 576460752303423488 1152921504606846976 2305843009213693952 4611686018427387904 9223372036854775808 18446744073709551616 36893488147419103232 73786976294838206464 147573952589676412928 295147905179352825856 590295810358705651712 1180591620717411303424 2361183241434822606848 4722366482869645213696 9444732965739290427392 18889465931478580854784 37778931862957161709568 75557863725914323419136 151115727451828646838272 302231454903657293676544 604462909807314587353088 1208925819614629174706176 2417851639229258349412352 4835703278458516698824704 9671406556917033397649408 19342813113834066795298816 38685626227668133590597632 77371252455336267181195264 154742504910672534362390528 309485009821345068724781056 618970019642690137449562112 1237940039285380274899124224 2475880078570760549798248448 4951760157141521099596496896 9903520314283042199192993792 19807040628566084398385987584 39614081257132168796771975168 79228162514264337593543950336 158456325028528675187087900672 316912650057057350374175801344 633825300114114700748351602688 1267650600228229401496703205376 2535301200456458802993406410752 5070602400912917605986812821504 10141204801825835211973625643008 20282409603651670423947251286016 40564819207303340847894502572032 81129638414606681695789005144064 162259276829213363391578010288128 324518553658426726783156020576256 649037107316853453566312041152512 1298074214633706907132624082305024 2596148429267413814265248164610048 5192296858534827628530496329220096 10384593717069655257060992658440192 20769187434139310514121985316880384 41538374868278621028243970633760768 83076749736557242056487941267521536 166153499473114484112975882535043072 332306998946228968225951765070086144 664613997892457936451903530140172288 1329227995784915872903807060280344704 2658455991569831745807614120560689408 5316911983139663491615228241121378816 10633823966279326983230456482242757632 21267647932558653966460912964485515264 42535295865117307932921825928971030528 85070591730234615865843651857942061056 170141183460469231731687303715884122112 340282366920938463463374607431768244224 680564733841876926926749214863536488448 136112946768375385385349842972707297696 272225893536750770770699685945414595392 544451787073501541541399371890829190784 1088903574147003083082798743781658381568 2177807148294006166165597487563316763136 4355614296588012332331194975126633526272 8711228593176024664662389950253267052544 17422457186352049329324779900506534105088 34844914372704098658649559801013068210176 69689828745408197317299119602026136420352 139379657490816394634598239204052272840704 278759314981632789269196478408104545681408 557518629963265578538392956816209091362816 1115037259926531157076785913632418182725632 223007451985306231415357182726483636545126144 446014903970612462830714365452167273090252288 892029807941224925661428730904334546180504576 1784059615882449851322857461808669092361007152 3568119231764899702645714923617338184722014304 7136238463529799405291429847234676369444028608 14272476927059598810582859694469352738888057216 285449538541191976211657193889387054777761114432 570899077082383952423314387778774109555522228864 1141798154164767904846628775557548219111044517728 2283596308329535809693257551115096438222089035456 4567192616659071619386515102230192876444178070912 9134385233318143238773030204460385752888356141824 18268770466636286477546060408920771505776712283648 36537540933272572955092120817841543011553424567296 73075081866545145910184241635683086023106849134592 146150163733090291820368483271366172046213698269184 292300327466180583640736966542732344092427396538368 584600654932361167281473933085464688184854793076736 1169201309864722334562947866170929376369709586153472 2338402619729444669125895732341858752739419172306944 4676805239458889338251791464683717504478838344613888 9353610478917778676503582929367435008957676689227776 18707220957835557353007165858734870017915353378455552 37414441915671114706014331717469740035830706756911104 74828883831342229412028663434939480071661413513822208 149657767662684458824057326869878960143322827027644416 299315535325368917648114653739757920286645654055288832 598631070650737835296229307479515840573291310110577664 11972621413014756705924586149590316811465826202211555328 23945242826029513411849172299180633622931652404423110656 47890485652059026823698344598361267245863304808846221312 95780971304118053647396689196722534491726609617692442624 191561942608236107294793378393445068983453219235384885248 38312388521647221458958675678689013796690643847076977056 76624777043294442917917351357378027593381287694153954112 153249554086588885835834702714756055186762575388307808224 306499108173177771671669405429512110373525150776615616448 61299821634635554334333881085902422074705030155323122896 12259964326927110866866776217180484414940060031064625792 24519928653854221733733552434360968829880120062129251584 4903985730770844346746710486872193765976024012425831168 9807971461541688693493420973744387531952048024851662336 19615942922883377386986841947488775063904096049703324672 3923188584576675477397368389497755012780819209940664944 7846377169153350954794736778995510025561636198801329888 15692754338306701909589473557991020051123272397602659776 31385508676613403819178947115982040102246544795205319552 62771017353226807638357894231964080204493089590410639104 125542034706453615276715788463928160408986179800821278208 251084069412907230553431576927856320817972359601642556416 502168138825814461106863153855712641635944719203285112832 1004336277651628922213726307711425282671889438406570225664 2008672555303257844427452615422850565343778876813140451328 4017345110606515688854905230845701130687557753626280902752 803469022121303137770981046169140226137511550725256180544 1606938044242606275541962092338280452275023101450512360896 3213876088485212551083924184676560904550046202901024721792 6427752176970425102167848369353121809100092405802049443584 12855504353940850204335696738706236618200184811604098887168 25711008707881700408671393477412473236400369623208197774336 51422017415763400817342786954824946472800739246417155468672 102844034831526801634685573909649892945601478492834310937344 205688069663053603269371147819299785911202956985668621874688 411376139326107206538742295638599571822405913971337243749376 822752278652214413077484591277199143644811827942674487498752 1645504557304428826154969182554398287289637655885348974997504 3291009114608857652309938365108796574579275311770697949995008 6582018229217715304619876730217593149158450623541395899990016 13164036458435430609239753460435186298368012470082791799980032 26328072916870861218479506920870372596736024940165583599960064 52656145833741722436959013841740745193472049880331166719920128 105312291667483444873918027683481490388944097600662333439840256 210624583334966889747836055366962980777888019201324666879680512 421249166669933779495672110733925961555776038402649333759361024 842498333339867558991344221467851923111552076805298667518722048 1684996666679735117982688442935703846223104153610597335037444096 3369993333359470235965376885871407692446208307221194670074888192 6739986666718940471930753771742815384892416614442389340149776384 13479973333437880943861507543485706769784833228884778680299552768 26959946666875761887723015086971413539569666457769557360599105536 53919893333751523775446030173942827079139333115539114711982210752 107839786667503047550892060347885654158278666231078229439764421504 215679573335006095101784120695771308365557332462156458879528843008 431359146670012190203568241391542616731114664924313291775057686016 862718293340024380407136482783085233462229329848626583500113732032 1725436586680048760814272965566170466924458659697253167000227464064 3450873173360097521628545931132340933848917319394506334000455328128 6901746346720195043257091862264681867697834638789012668000910656256 1380349269344039008651418372452936373539566927757802533600182112512 2760698538688078017302836744905872747079133855515605067200364225024 5521397077376156034605673489811745494158267711032100134400728450048 11042794154752312069211346979623490988316544222064200268801456900096 22085588309504624138422693959246981976633088444128400537602913800192 44171176619009248276845387918493963953266176888256801075205827600384 88342353238018496553690775836987927906532353776513602150411655200768 176684706476036993107381551673975855813064707553027204300823310401536 353369412952073986214763103347951711626129415106054408601646620803072 706738825904147972429526206695903423252258830212108817203293241606144 1413477651808295944859052413391806846504517660424217634406586483212288 2826955303616591889718104826783613693009035320848435268813172966424576 5653910607233183779436209653567227386018070641696870537626345932849152 11307821214466367558872419307134454772036141283393741075252691865698304 22615642428932735117744838614268909544072282566787482150505383731396608 45231284857865470235489677228537819088145651333574964301010767462793216 90462569715730940470979354457075638176291130267149928602021534925586432 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1482138742222535728676525743424727255880357112498584561283200828220808101888 2964277484445071457353051486849454511760714224997169122566401656441616203776 5928554968890142914706102973698909023521428449994338245132803312883232407552 11857109937780285829412205947397818047042856899988676490265606625764664815104 23714219875560571658824411894795636094085713799977352980531213251529329630208 47428439751121143317648823789591272188171427599954705961062426503058659260416 94856879502242286635297647579182544376342855199909411922124853006117318520832 189713759004484573270595295158365088752685710399
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