

## Notes Graph Theory Applications--Scheduling

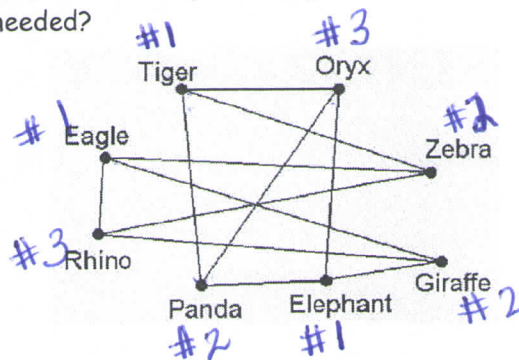
Things to keep in mind . . .

- each object will be represented by a vertex
- an edge will represent objects which cannot be placed together

**Example 1** The following graph represents zoo animals which cannot be placed together in enclosures. What is the minimum number of enclosures needed?

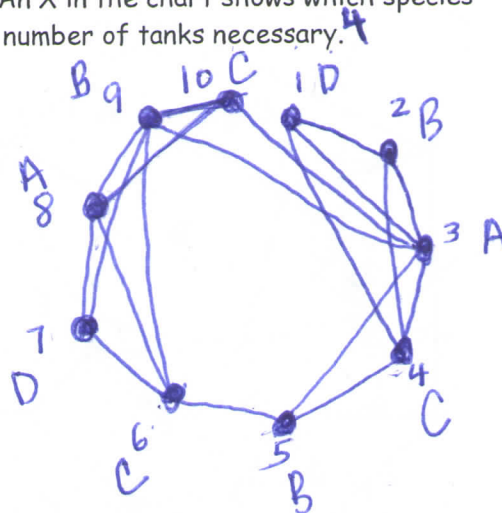
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#1: Tiger, Eagle, Elephant  
 #2: Zebra, Giraffe, Panda  
 #3: Oryx, Rhino



**Example 2** Suppose a pet store has 10 types of fish. Some of the species naturally are prone to attack each other and cannot be stored in the same tank. An X in the chart shows which species are incompatible with each other. Determine the minimum number of tanks necessary.

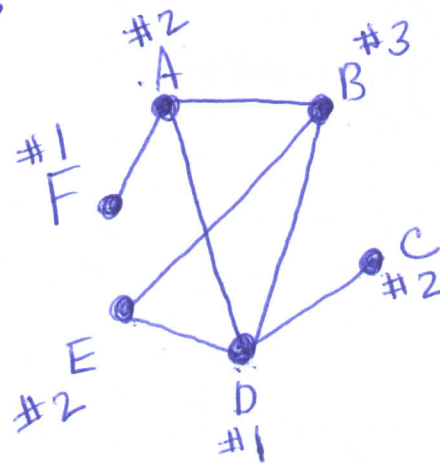
Species	1	2	3	4	5	6	7	8	9	10
1		X	X	X						
2	X		X	X						
3	X	X		X	X				X	X
4	X	X	X		X					
5			X	X		X				
6					X		X	X	X	
7						X		X	X	
8						X	X		X	X
9			X			X	X	X		X
10			X					X	X	



A: 3, 8    B: 2, 5, 9    C: 4, 6, 10    D: 1, 7

**Example 3** The Federal Communications Commission (FCC) monitors radio stations to make sure that their signals do not interfere with each other. They prevent interference by assigning appropriate frequencies to each station. Suppose two stations cannot use the same channel when they are within 150 miles of each other. How many different frequencies are needed for the six stations located at the distances shown in the table?

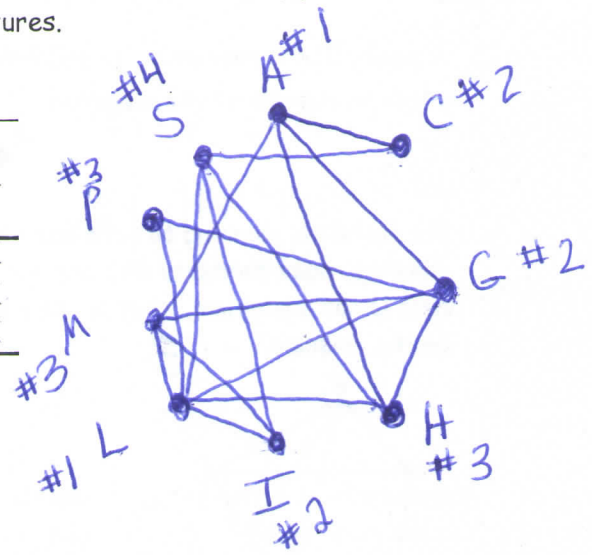
	KQAA	KQBB	KQCC	KQDD	KQEE	KQFF
KQAA	-	25	202	77	375	106
KQBB	25	-	175	51	148	222
KQCC	202	175	-	111	365	411
KQDD	77	51	111	-	78	297
KQEE	375	148	365	78	-	227
KQFF	106	222	411	297	227	-



#1: D, F    #2: A, C, E    #3: B

**Example 4** Suppose that you are responsible for scheduling times for lectures in a university. You want to make sure that any two lectures with a common student occur at different times to avoid a conflict. We could put the various lectures on a chart and mark with an "X" any pair that has students in common. Determine a schedule for the lectures.

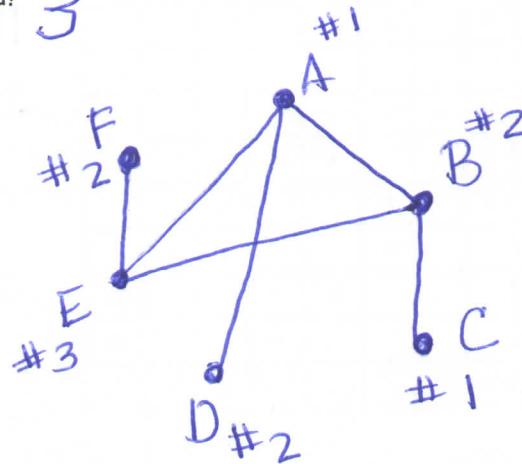
Lecture	A	C	G	H	I	L	M	P	S
Astronomy		X	X	X			X		
Chemistry	X								X
Greek	X			X		X	X	X	
History	X		X			X			X
Italian						X	X		X
Latin			X	X	X		X	X	X
Music	X		X		X	X			
Philosophy			X			X			
Spanish		X		X	X	X			



- #1: Astronomy, Latin
- #2: Chemistry, Greek, Italian
- #3: History, Music, Philosophy
- #4: Spanish

**Example 5** An architecture firm must schedule meeting times for its working groups. The following chart indicates which projects have overlapping members for their working groups. Create a graph that would be used to decide how many different meeting times would be required. What is the fewest meeting times needed?

	A	B	C	D	E	F
A		X		X	X	
B	X		X		X	
C		X				
D	X					
E	X	X				X
F					X	



- #1: A, C
- #2: B, D, F
- #3: E