Activity Period 1: (5 minutes) [Tourist Problem]

Bus Scheduling DIY: (Do It Yourself)

Tourist Problem Version 1.0
Given: A list of tourist, each with his/her list of places to visit.
To do: Schedule bus rides for them so that
each tourist visits all the places in his/her list, and
C1: Each tourist visits *at most one place a day,*
C2: There is *at most one bus trip to each place, and*
C3: *minimize* the number of days to complete mission.

An Instance of Tourist Problem

Tourist	Places of Interest
Aaron	SZG, BG, JB
Betty	CG, JG, BG
Cathy	VC, SI, OR
David	JG, CG, OR
Evans	CG, JG, SZG

Q1: Using the above information, try to schedule the bus trips and minimize the number of days needed to complete all the bus trips.

Day 1: ______________________________

Day 2: ______________________________

Day 3: ______________________________

Day 4: ______________________________

Day 5: ______________________________

Day 6: ______________________________

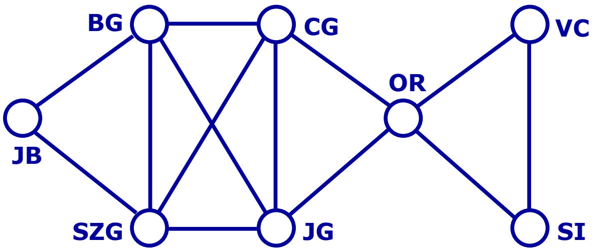
Q2: What was the key idea you used in your method of scheduling?

Activity Period 2: (8 minutes) [The Tourist Problem]

The Tourist Problem **Your Name:** ____________________________

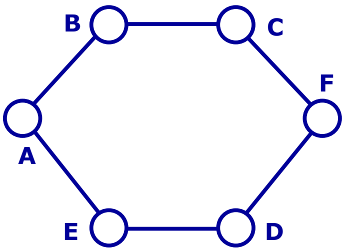
The tourist problem instance in the lecture can be modeled with the following graph. Two possible colourings of the graph are given in the lecture.

Q1: Give a *different* way to colour the vertices of the graph on the left. How many colours?

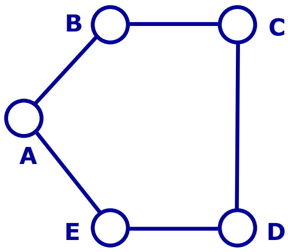


Q1: # colours: ______

Q2: Try coloring the following graphs with the minimum number of colours.

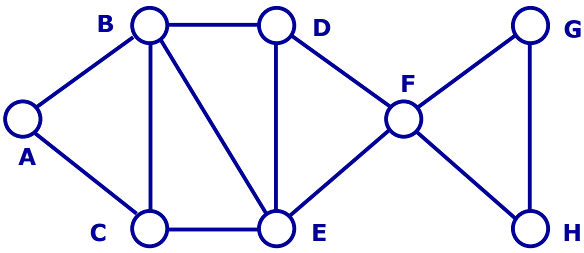


Q2(a): # colours: ______

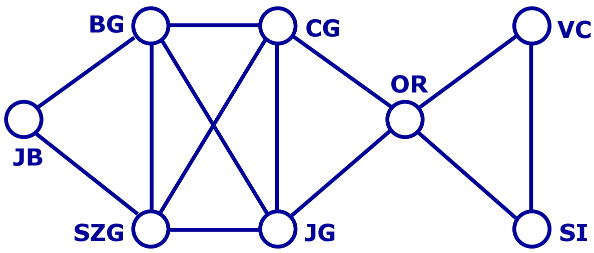


Q2(b): # colours: _____

Q3: What about this one (below, left)?



Q3: # colours: ______



Q4: With 3 colours? YES / NO

Q4: Can you colour the graph (above, right) with only three (3) colours.

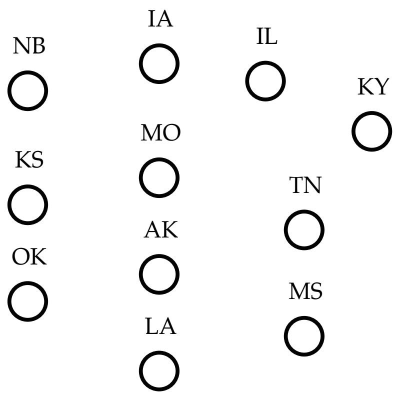
Activity Period 3: (8 minutes) [Map Colouring & Fish in a Tank]

Map Colouring **Your Name:** ________________________________

Try coloring the following 11 states (of the USA) given in the map below.
[*If you do not have so many different colored pencils/pens with you, you can just assign different numbers to the states to mean different colors.*]

Q1: How many colors did you use? Can it be done in fewer colors?

Q2: Draw a graph model for the map and then color the graph. Is it easier?



Q3: Now imagine that I give you a large map with 50,000 states (countries).
Which is easier – color the map directly, or use graph coloring?

Q4, Q5: (TAKE HOME ACTIVITY) Now repeat Q1 and Q2 with the map given below:

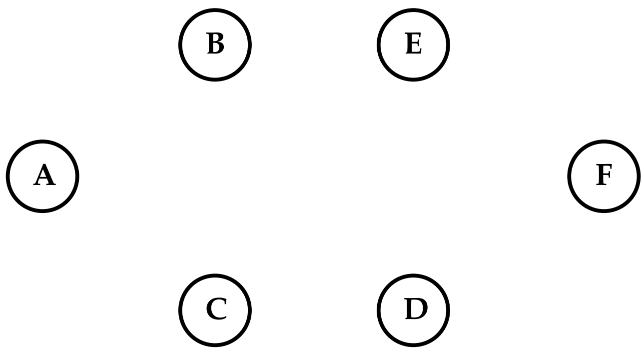
Fish in a Task: **Your Name: ____**

A tropical fish hobbyist has six different types of fish: *Angelfish, Betta, Catfish, Danio, Eel and Fingerfish*, which shall henceforth be designated by A, B, C, D, E, and F, respectively. Because of many factors (including predator-prey relationship, water conditions, and size) some fish can be kept in the same tank, while others *cannot* be together. The table below shows which fish *cannot* be together. (For example, B cannot be together with A, C, or E.)

Fish	Conflicts with …
A	B, C
B	A, C, E
C	A, B, D, E
D	C, F
E	B, C, F
F	D, E


Q1: What is the smallest number of tanks needed to keep *all* the fish?

Use a graph model to help find the answer.
You can start with the partial graph shown below. Add edges to the graph.


Q2: Write down your solution:

Tank #	Conflicts with …
Tank 1	
Tank 2	
Tank 3	
Tank 4	

Q3: Are there other "equivalent" solutions?

Q4: How is the graph model useful to solving your problem?

TAKE HOME Activity:

Frequency Assignment: (Hands-On Activity)

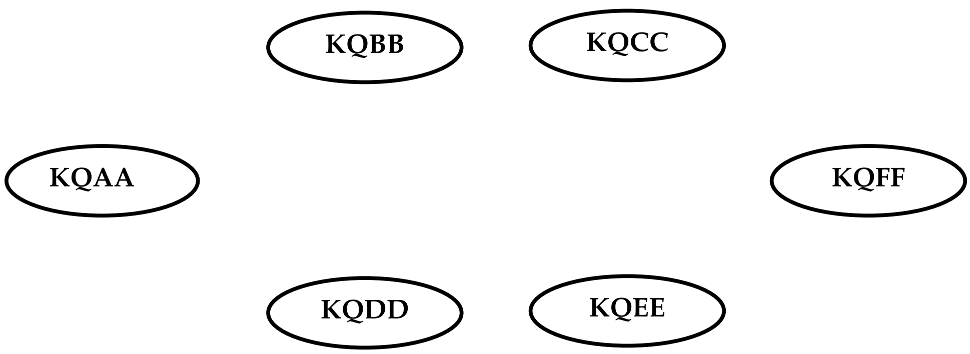
The Federal Communications Commission (FCC) monitors radio stations to make sure that their signals do not interfere with each other. They prevent interference by assigning appropriate frequencies to each station.

How many different frequencies are needed for the six stations located at the distances shown in the table, if two stations cannot use the same channel when they are within 150 miles of each other?

Before you start, think about this: (a) What will each vertex represent? (b). What will each edge represent? (c). How many colours to colour the resulting graph?

	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	-

Draw your graph model below:



Q1. How many channel are needed?

Q2. Answer Q1 again if the distance between KQBB & KQFF is changed from 222 to 122?

Q3. What if the distance between KQAA and KQEE is change from 375 to 75?

TAKE HOME Activity: (A littler harder…)

Map Coloring with COST! (Hands-On Activity)

Now you need to color the map of South America (ignore the islands). This may seem easy, but there are some restrictions:
1. No country may touch another country of the same color.
2. You will be charged *each* time you use a color to fill in a country – regardless of its size.
3. You must color the map as *cheaply* as possible.

The cost of each color is shown below.

Color	Cost/Country
Red	$100
Blue	$200
Green	$300
Orange	$400
Yellow	$500
Purple	$600

COLORS:

Argentina: ___________
Bolivia: ______________
Brazil: ______________
Chile: ______________
Columbia: ___________
Ecuador: ____________
French Guiana: ______
Guyana: ____________
Paraguay: ___________
Peru: _______________
Suriname: ___________
Uruguay: ____________
Venezuela: ___________

Q1: Your answer: Total cost to color the map is ___$________________

Q2: How many colours did you use? _________________

Q3: What is the most expensive colour you used? _______________