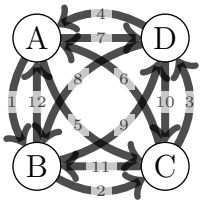
Solve the puzzles in groups of 1 to 5. Groups will present solutions at the board; everyone hands in their own copy of the worksheet.

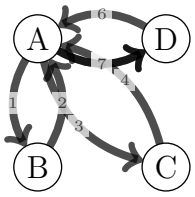
We ended last time with the Blik game. "**In the Blik game, you can pass the Mr. Blik to anyone you have not passed it to before. Alex, Brad, Chad, and Dave are playing the Blik game. Alex starts with it. What is the most number of passes one can have total? What is the least number?**" We had some answers (Andrew gave us the least, and a group effort gave us the most):

$A \to B \to C \to D \to A \to C \to A \to D \to B \to D \to C \to B \to A$



Alex:	B, C, D;	3 passes
Brad:	C, D, A;	3 passes
Chad:	C, A, B;	3 passes
Dave:	A, B, C;	3 passes
Total:		;12 passes

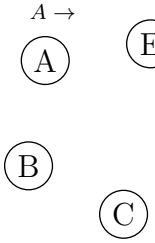
$A \to B \to A \to C \to A \to D \to A$



Alex:	B, C, D;	3 passes
Brad:	A	;1 passes
Chad:	A	;1 passes
Dave:	A	;1 passes
Total:		;6 passes

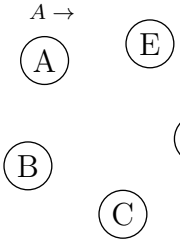
(B1) What happens if Evan joins the game? "**In the Blik game, you can pass the Mr. Blik to anyone you have not passed it to before. Alex, Brad, Chad, Dave, and Evan are playing the Blik game. Alex starts with it. What is the most number of passes one can have total? What is the least number?**" Draw two plays of the game (like above), one with lots of passes, and one with few.

$A \to$



Alex:	;	passes
Brad:	;	passes
Chad:	;	passes
Dave:	;	passes
Evan:	;	passes
Total:	;	passes

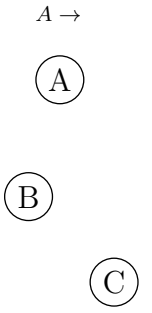
$A \to$



Alex:	;	passes
Brad:	;	passes
Chad:	;	passes
Dave:	;	passes
Evan:	;	passes
Total:	;	passes

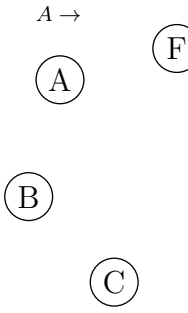
(B2) What about 6 people?

$A \to$



Alex:	;	passes
Brad:	;	passes
Chad:	;	passes
Dave:	;	passes
Evan:	;	passes
Fred:	;	passes
Total:	;	passes

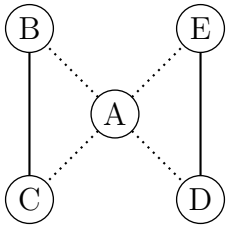
$A \to$



Alex:	;	passes
Brad:	;	passes
Chad:	;	passes
Dave:	;	passes
Evan:	;	passes
Fred:	;	passes
Total:	;	passes

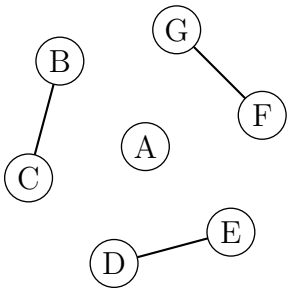
(B3) What about "N" people? What is the formula for the maximum number of passes? What is the formula for the minimum number of passes?

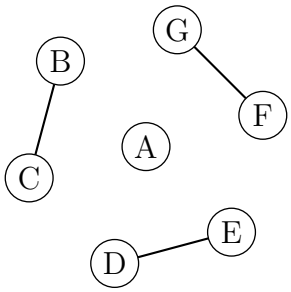
We started Monday with a friendship puzzle: "**Brad and Chad are friends. Dave and Evan are friends. Amongst Alex, Brad, Chad, Dave, and Evan, every pair of friends has exactly one other mutual friend. How many friends does Alex have?**" We found an answer, and it was pretty clear it was the only answer: Alex has 4 friends; everyone is friends with Alex. We even drew a picture to show the friendships.

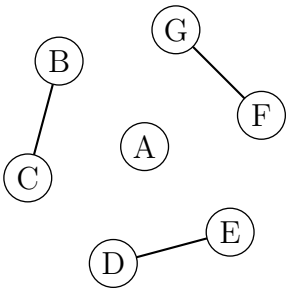


We changed it by adding Fred and Greg as friends. "**Brad and Chad are friends. Dave and Evan are friends. Fred and Greg are friends. Amongst Alex, Brad, Chad, Dave, Evan, Fred, and Greg, every pair of friends has exactly one other mutual friend. How many friends does Alex have?**"

(F1) How many friends *does* Alex have? Draw the different possibilities:

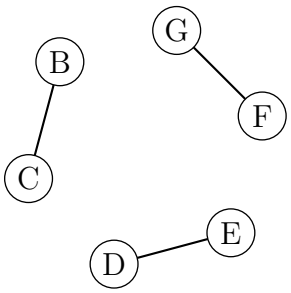


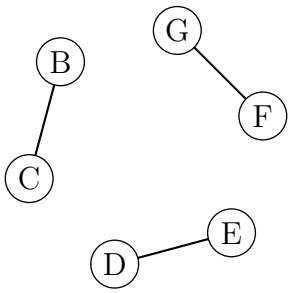


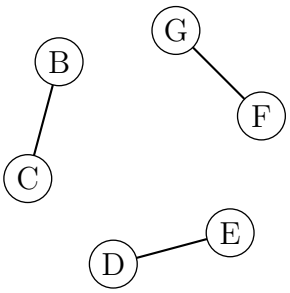


London asked about an even number, and we tried removing Alex: "**Brad and Chad are friends. Dave and Evan are friends. Fred and Greg are friends. Amongst Brad, Chad, Dave, Evan, Fred, and Greg, every pair of friends has exactly one other mutual friend. Who is friends with whom?**" Try to draw the friendships.

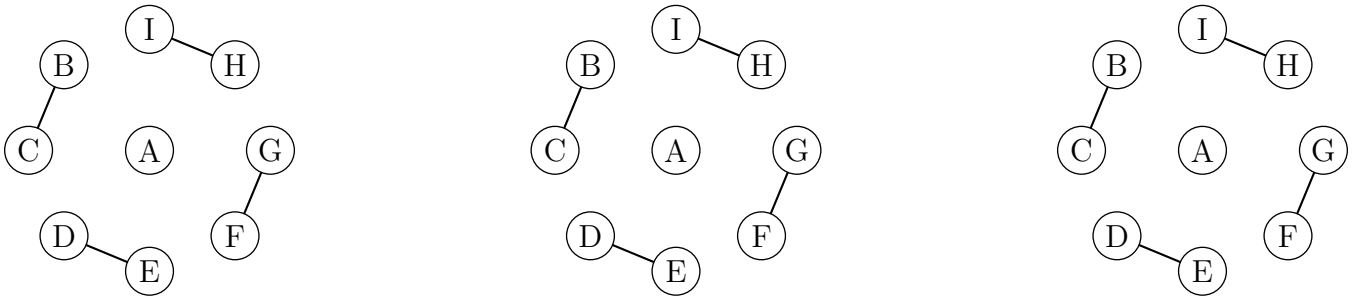
(F2) Explain why it cannot be done.



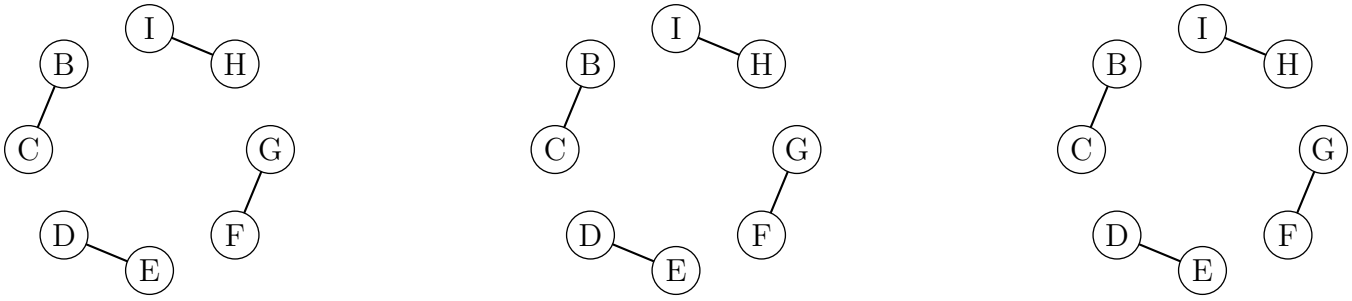




(F3) What if we have nine people, 4 pairs of them known to be friends? "**Brad and Chad are friends. Dave and Evan are friends. Fred and Greg are friends. Hank and Ivan are friends. Amongst Alex, Brad, Chad, Dave, Evan, Fred, Greg, Hank, and Ivan, every pair of friends has exactly one other mutual friend. How many friends does Alex have?**" Can you describe how every pair of friends could have exactly one mutual friend? In other words, can you draw the graph so that every edge is involved in exactly one triangle?



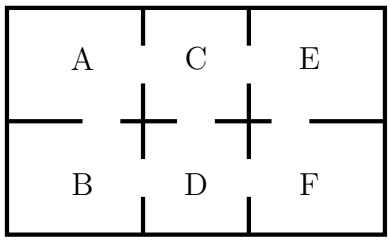
(F4) What if Alex gets left out? "**Brad and Chad are friends. Dave and Evan are friends. Fred and Greg are friends. Hank and Ivan are friends. Amongst Brad, Chad, Dave, Evan, Fred, Greg, Hank, and Ivan, every pair of friends has exactly one other mutual friend. Who is friends with whom?**" Can it be drawn at all?



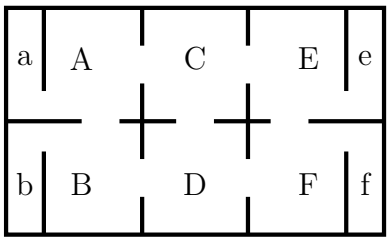
(F5) What happens with bigger odd numbers of people (with Alex and "N" other pairs of friends)?

(F6) What happens with bigger even numbers of people (without Alex; just "N" pairs of friends)?

My favorite puzzle is the Feng Shui dragon swooping through the rooms. "**The dragon inspects new homes for swoopability. It tries to swoop through every door exactly once. How can we tell if the house is swoopable?**" Katelyn explained why there cannot be very many dead-ends (the dragon would have to end at a dead-end, unless it started there; more than two dead-ends and the swoop must fail).



versus



(D1) Draw a blueprint with at least one dead-end that is still swoopable.

(D2) Draw a blueprint with no dead-ends (no closets), but which is still not swoopable.

(D3) How can you tell if a blueprint is swoopable just by looking at the number of doors in each room (without really caring where they go)?