MA111: Contemporary mathematics

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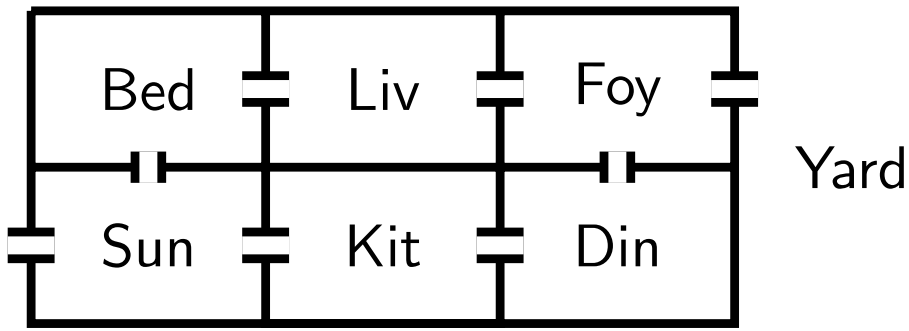
December 1, 2015

Entrance Slip (due 5 min past the hour):

- Can you go through all the doors exactly once?

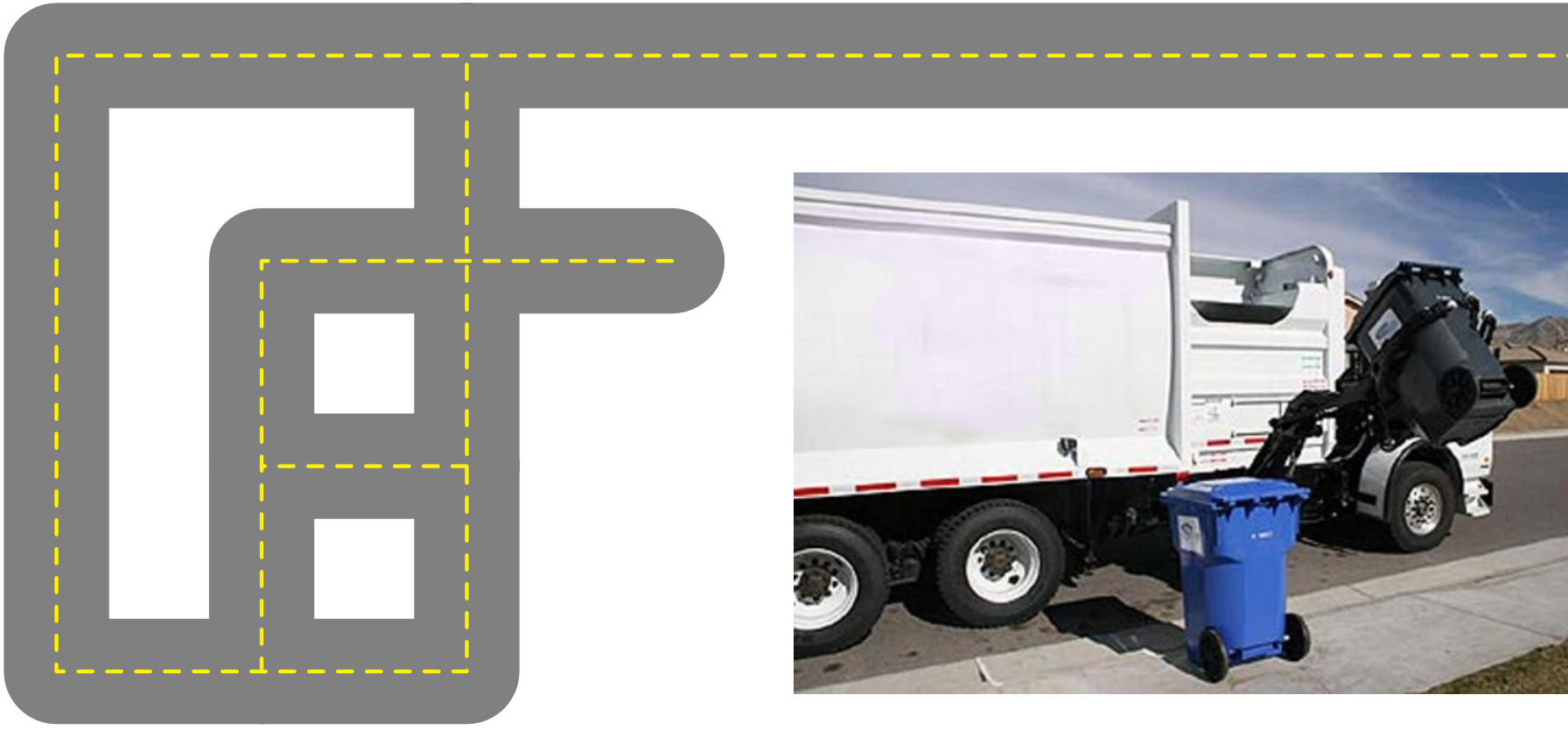


- Write down the path (labelled by rooms) or explain why there is no such path.

Today we introduce routing problems.

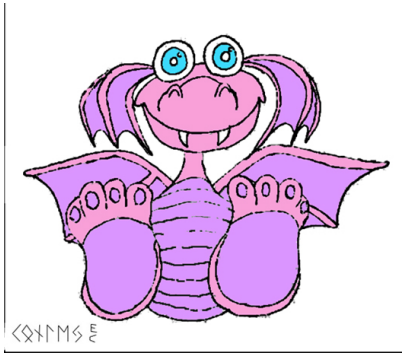
Garbage truck route

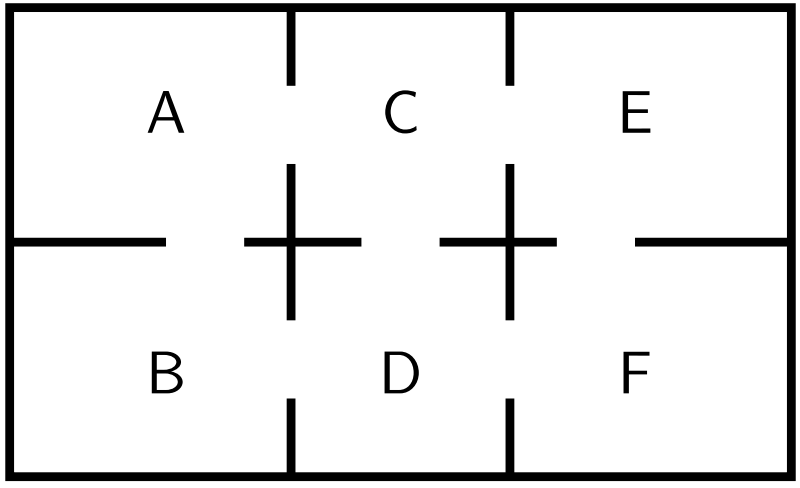
- The garbage truck enters and leaves from the right edge.
- How should it go through the neighborhood so its claw can get all the trash?



The dragon's tour

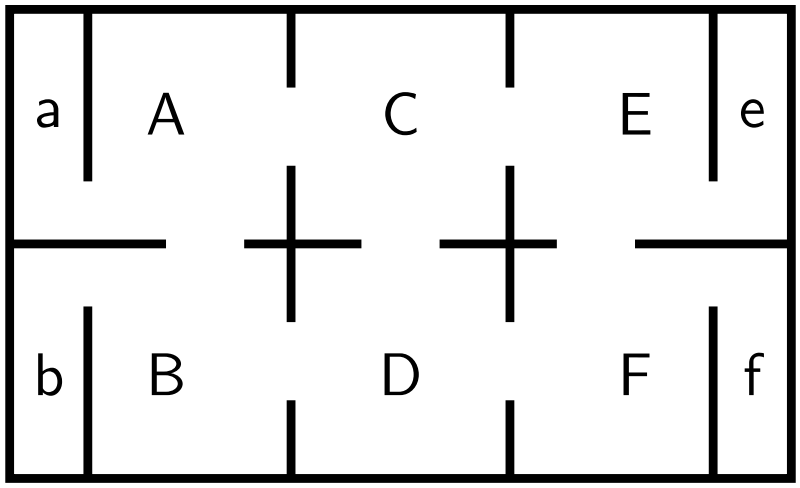
- When I move to a new place, I like to walk through every doorway
- It loses some newness if I go through a doorway more than once
- Can I tour the interior doors of the house without repeats?





The dragon's tour with toilets too

- When I move to a new place, I need to walk through every doorway
- I forgot the toilets and closets.
- Can I tour the interior doors of the house without repeats now?



On patrol again

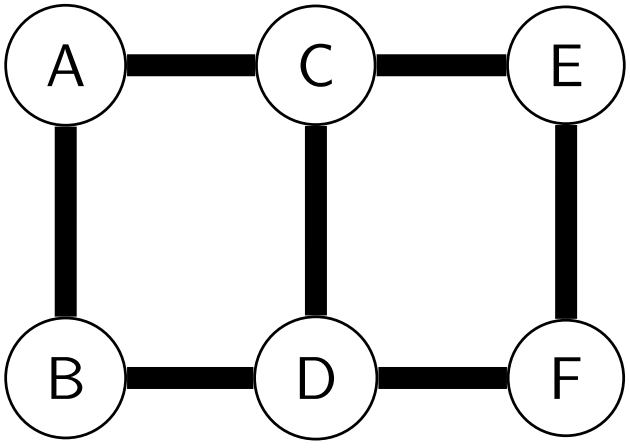
- Can the postal carrier walk every street exactly once
- They should start and end at the Post Office

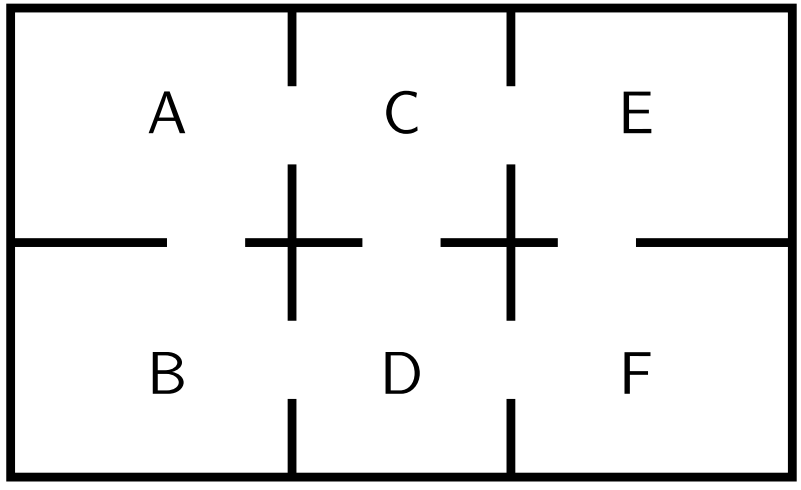
These are all the same question

- Mathematics looks at many different problems
  and finds the common structure
- A strategy to win all similar games
- The truck route has roads that connect intersections
- The house has doors that connect rooms
- The postal carrier has roads between intersections
- The generic has **edges** between **vertices**
  we want to travel over all edges

The house as a graph

- A simpler picture

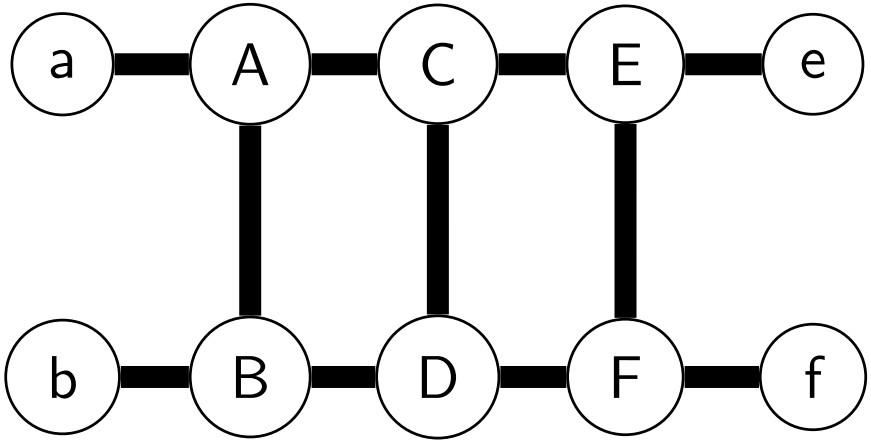


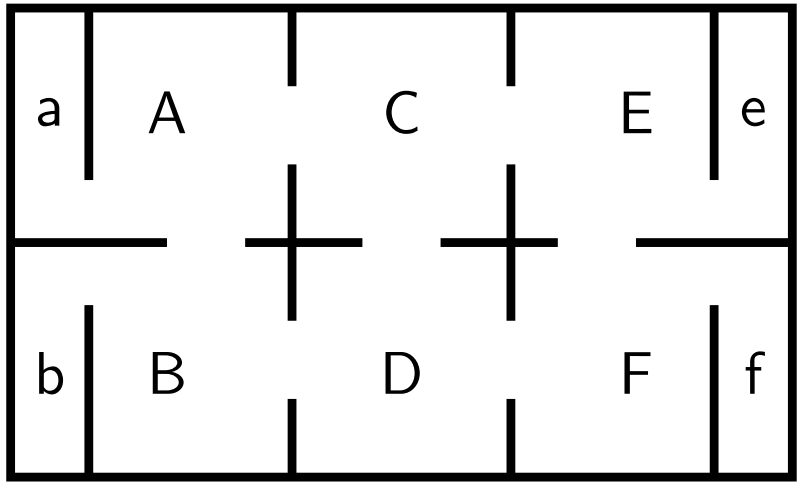


- The connections are the same in both pictures

The house with toilets as a graph

- A simpler picture

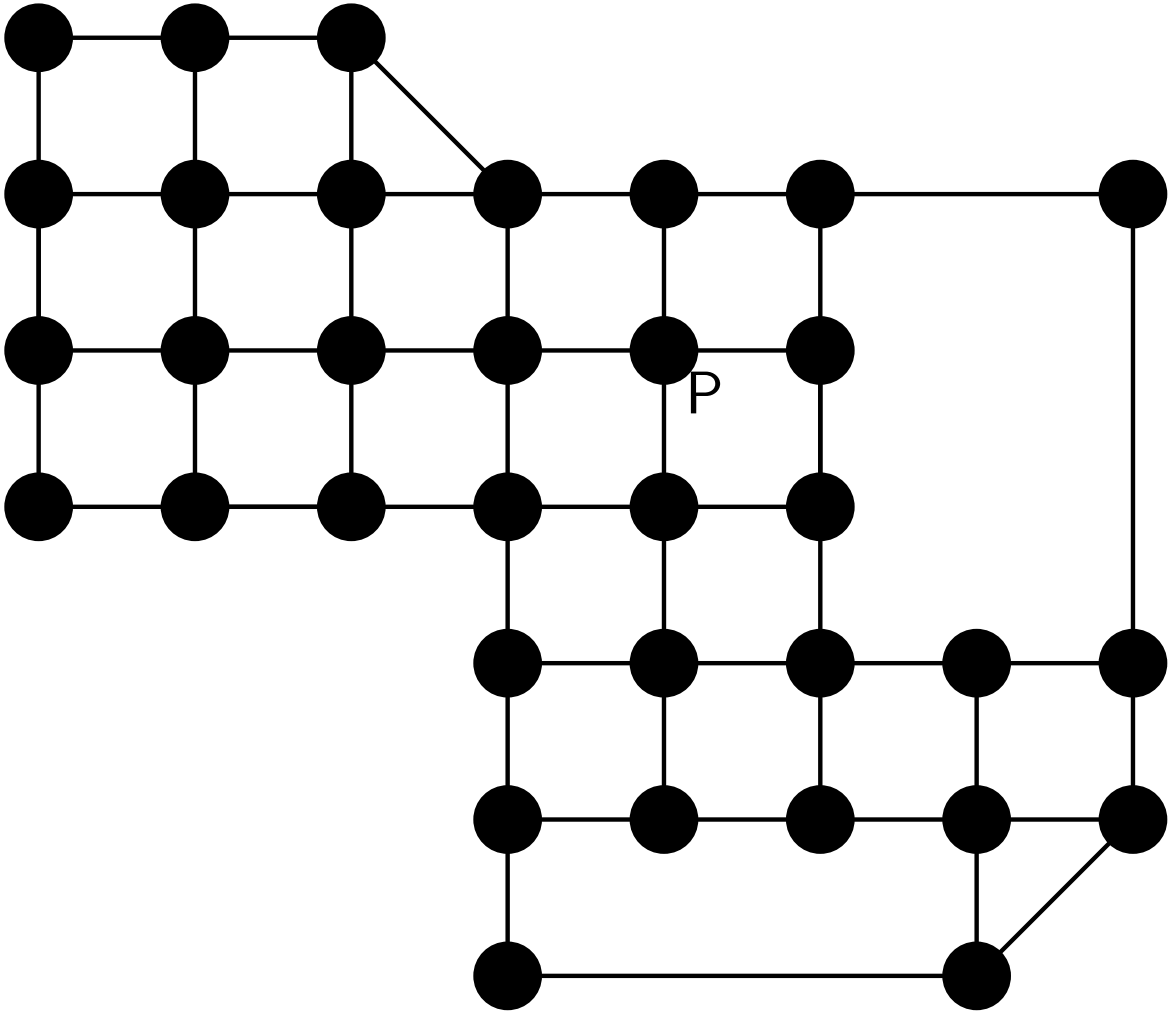




- The connections are the same in both pictures

The postal patrol

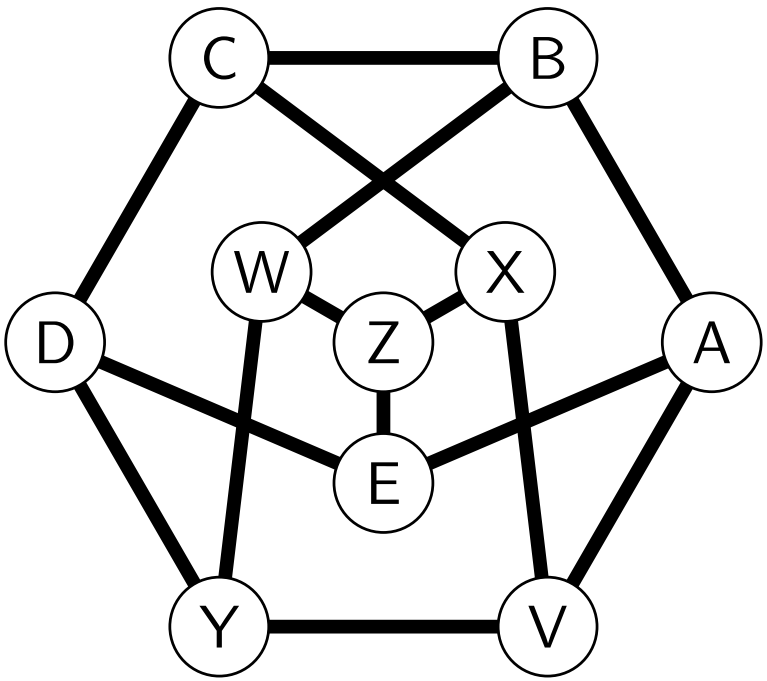
Here is the city as a graph

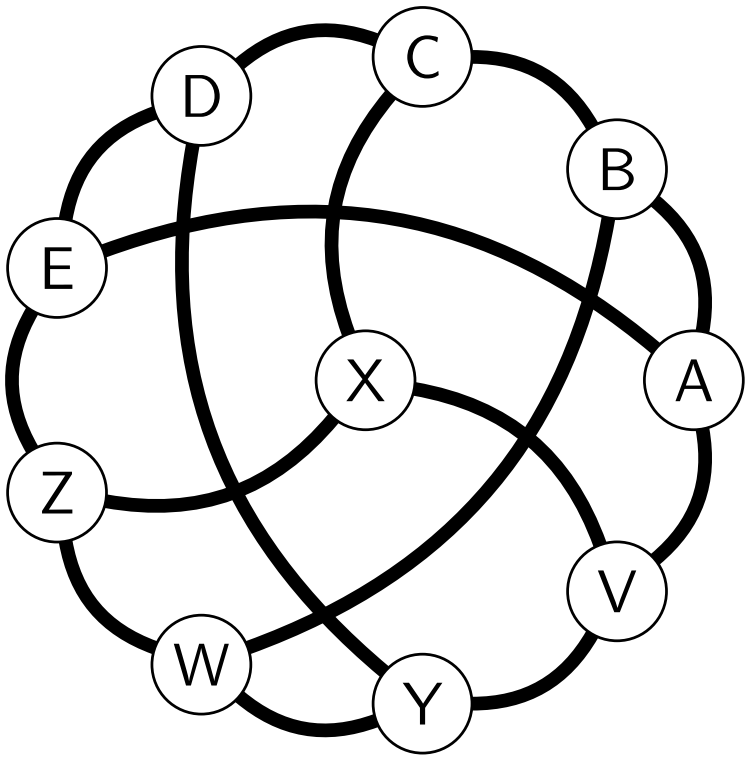


You draw them

- Draw a graph that can be traced
- Draw a graph that obviously can't be traced
- Draw a graph that can't be traced, but that might take a 5 yr old a little time to figure out
- Be prepared to draw at the board!

Can these be traced?





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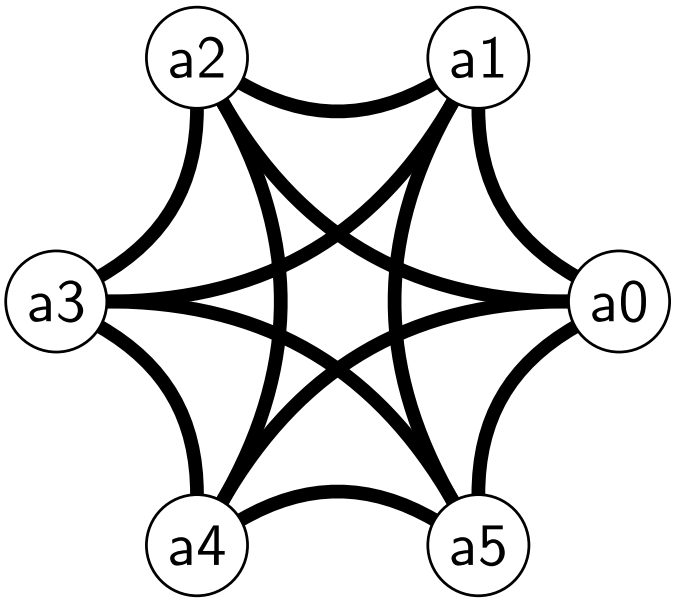
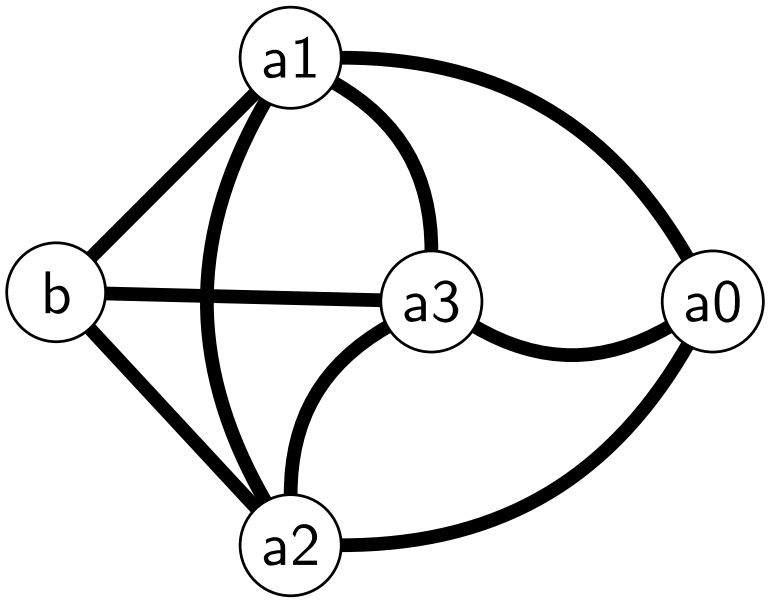
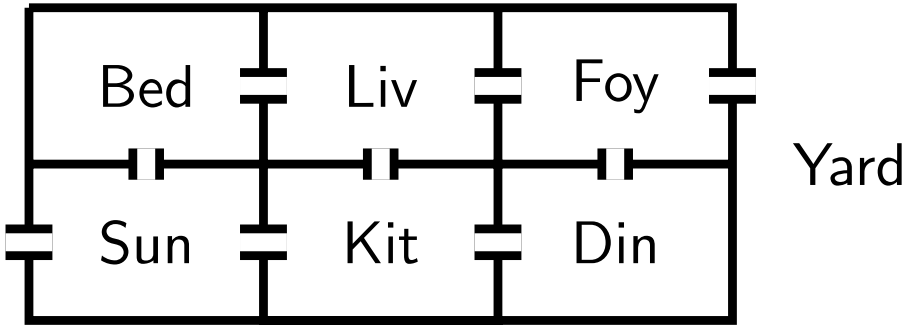




Assignments and exit slip

- **Exit slip:**

- Can you go through all the doors exactly once?



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