Graphs

A graph is a set of arcs called edges joined at points called vertices. (Sound familiar?) We don't allow an edge to start and end at the same vertex, and we don't allow two different arcs to start and end at the same two vertices.
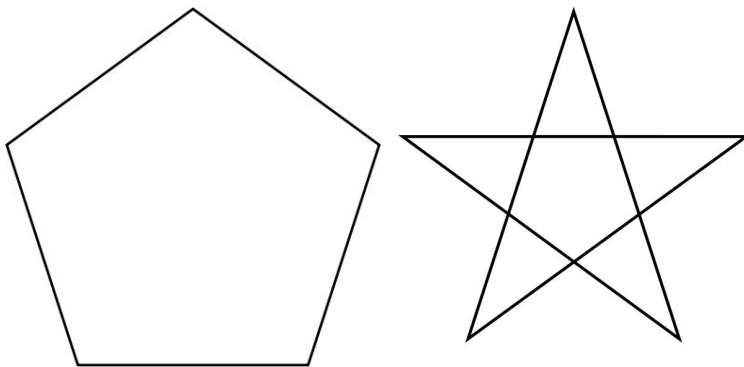
Graph isomorphism

Two graphs are considered the same if you can move and stretch one to look like the other. You can't tear. This is like our topological idea of equivalence, but it is "discrete".

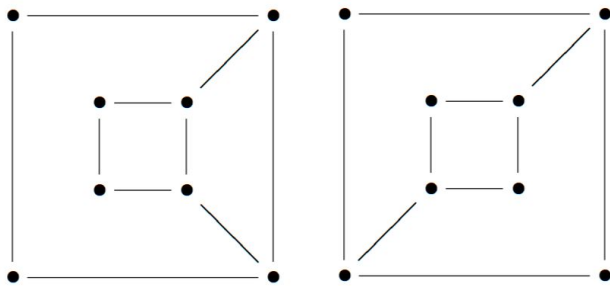# Ways to distinguish nonisomorphic graphs

- Count vertices
- Count edges
- Count the number of edges at each vertex
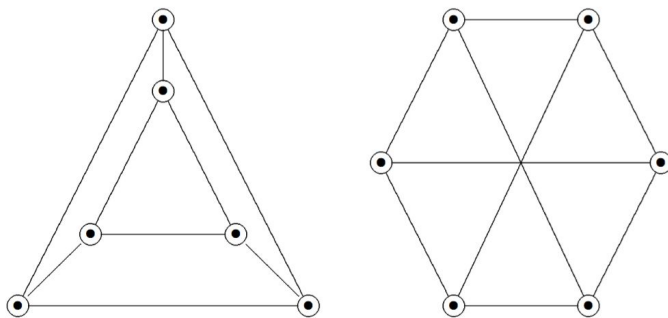- Count the number of "triangles"
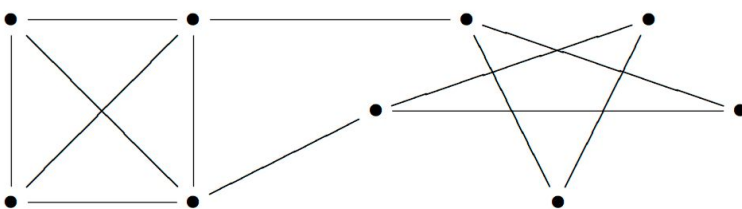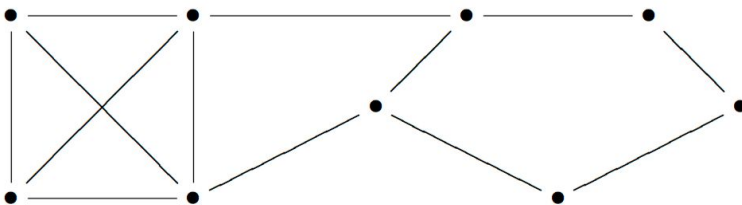- Etc, because anything goes!
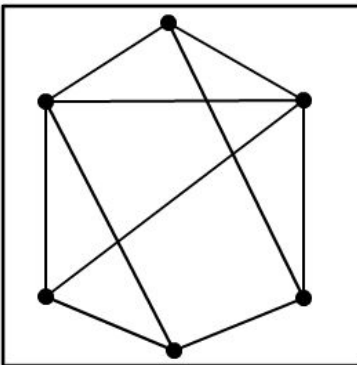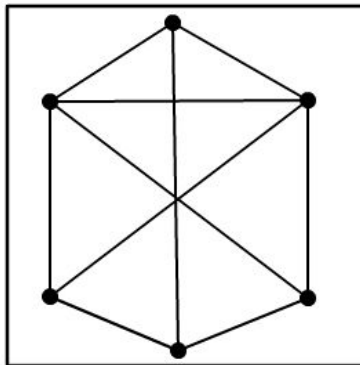
Are these the same?

Pair 0

Pair 1

Pair 2

Pair 3

Pair 4

Graph G

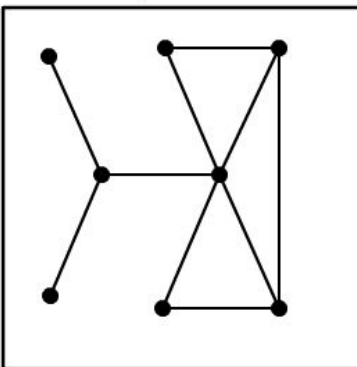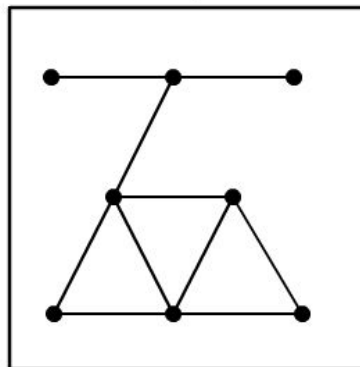Graph H

Pair 5

Graph G
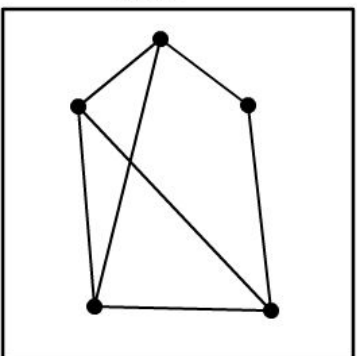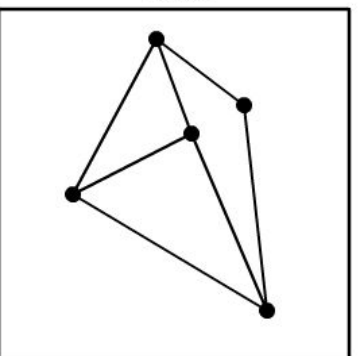
Graph H

Pair 6

Graph G

Graph H

Pair 7

Graph G

Graph H

Pair 8
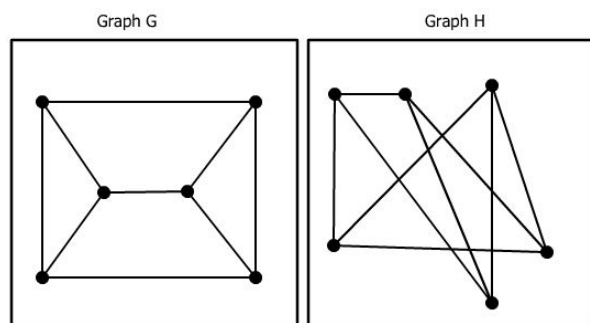
Graph G
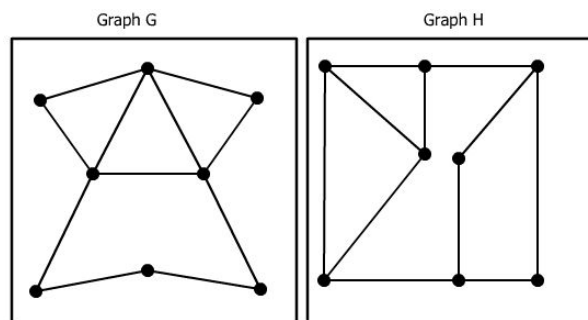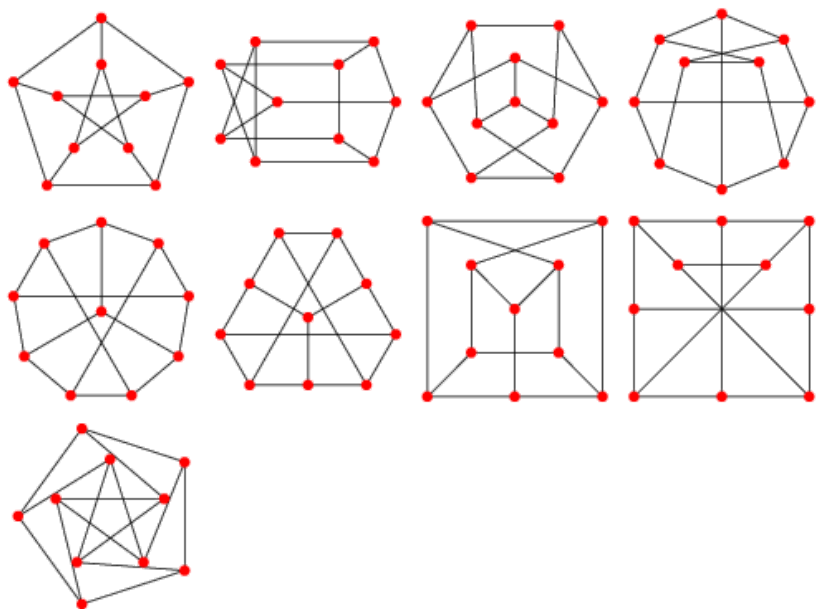
Graph H

Some graphs on ten vertices

Among the graphs below, which pairs are isomorphic? How many graphs are there really?

Exercises

- How many different graphs can you make with 3 edges? Draw your graphs below.

- How many different graphs can you make with 4 edges?

- How many different graphs can you make with 5 edges?

Isomorphism, revisited

At the beginning of the discussion, we gave an informal explanation of what it means for two graphs to be isomorphic to each other.

- Can you give a formal definition?

Think about the isomorphic graphs shown below. How could you convince your friend that they are isomorphic?