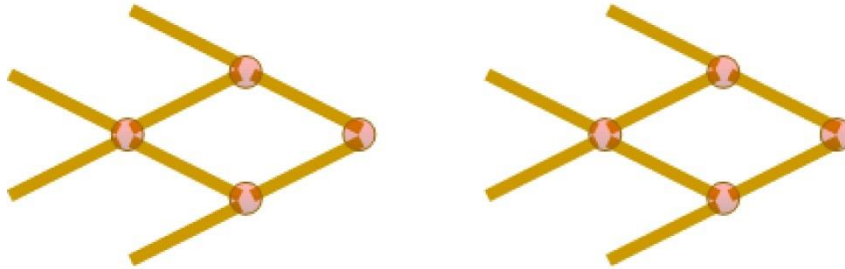
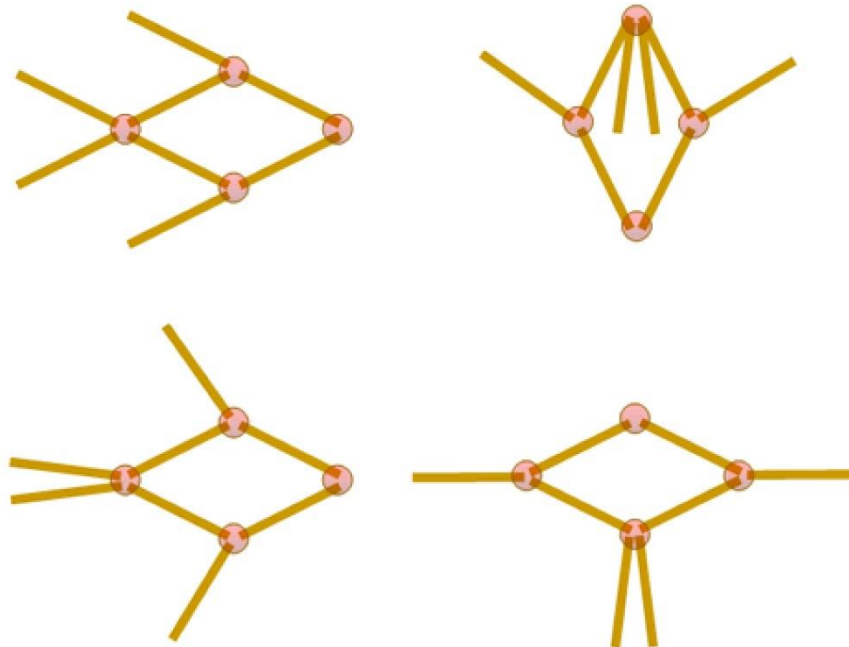


# Flexi Fish

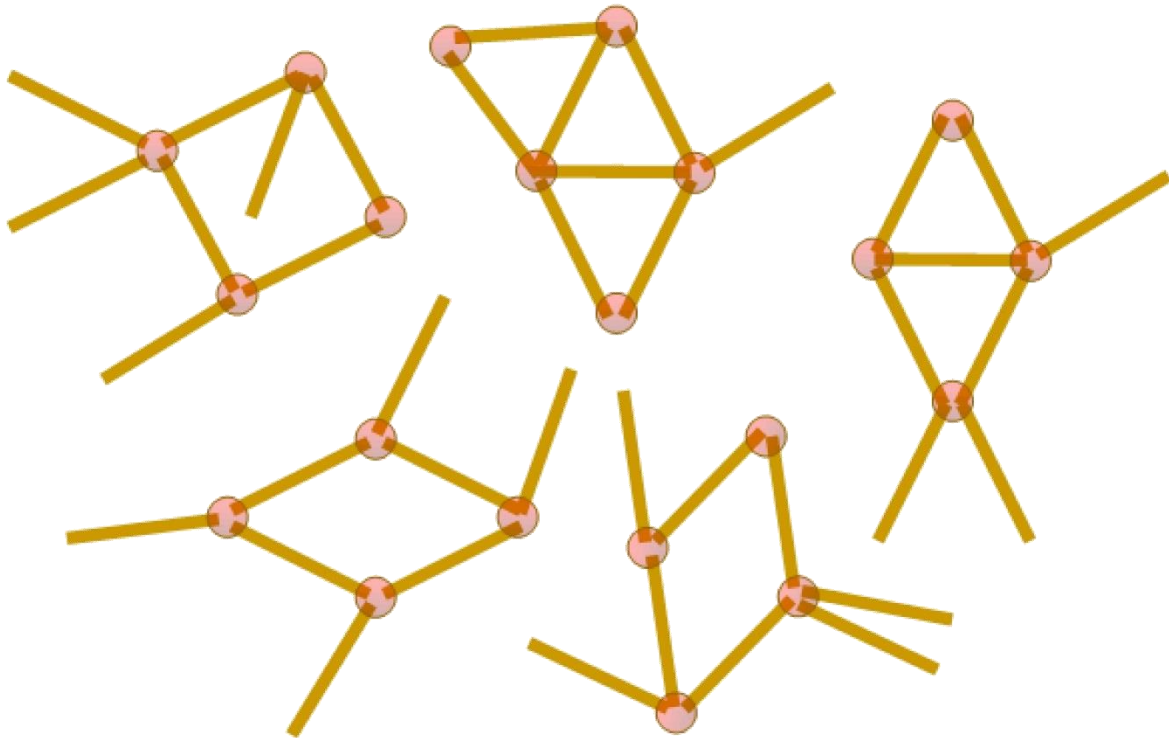
Imagine that all living things are made up of joints  and bones . For example, here are two flexi-fish swimming happily along:



You can see that a flexi-fish has 4 joints and 8 bones arranged in a special way. The bones can be moved about the joints so these 4 animals are flexi-fish in different positions:



A bone that is connected to a joint, cannot be pulled out of the joint. Also new joints cannot be formed just by changing position. This means that of the 5 animals below, only the one is a flexi-fish. Find which one?



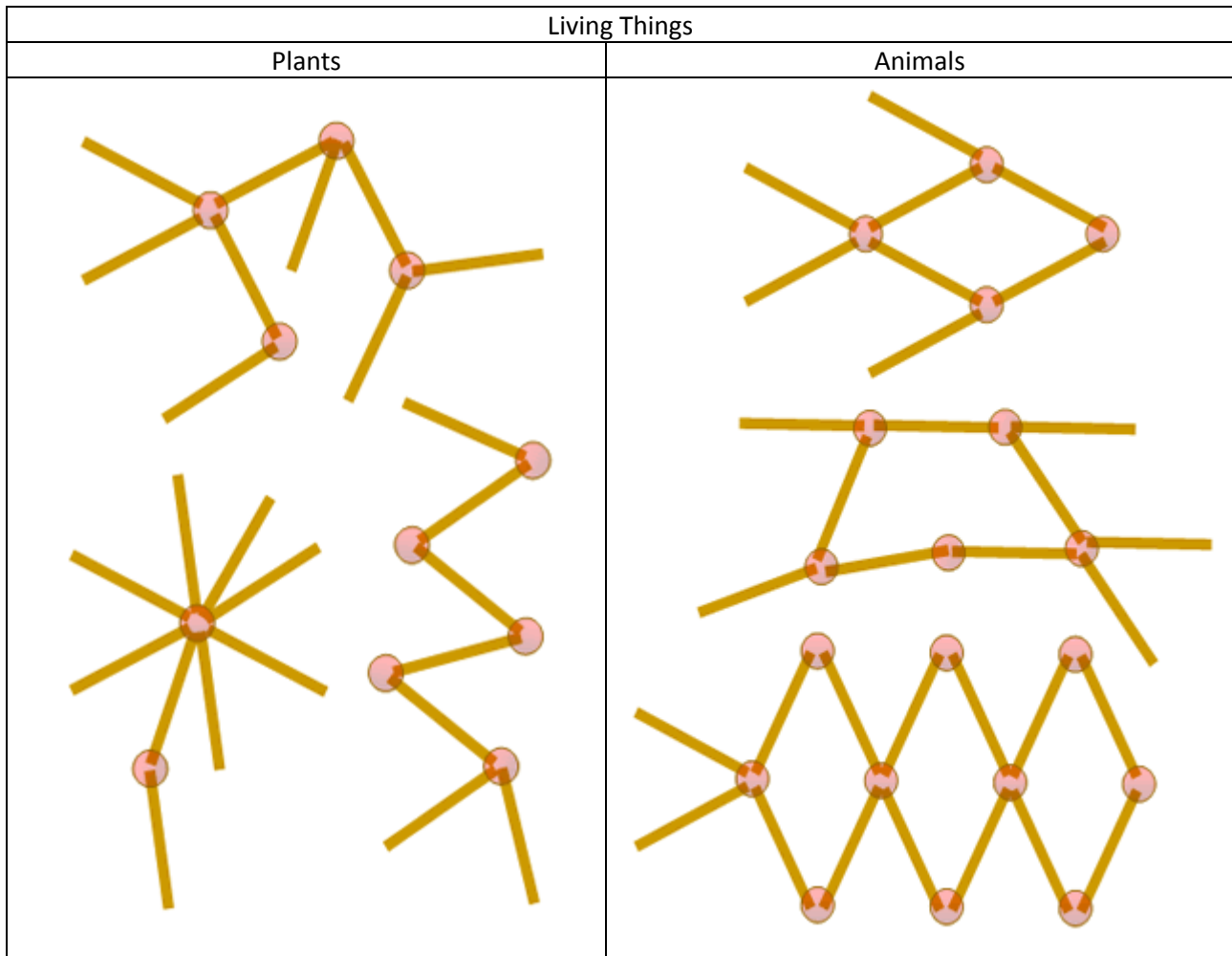
Only the upper left animal is a flexi-fish. The lower left animal has the right number of bones and joints, but it cannot change its position to become a flexi-fish.

### Cladistics - a game for 3 or more people

One person takes the role of the Biologist. The Biologist tells the other players that they have defined two types of living things. The Biologist draws a table with the heading of the two creature types at the top and then draws an example of each.

The other players take turns publically presenting the Biologist with a creature. The Biologist takes the new living thing and adds it to one or other column.

For example, the Biologist has grouped living things into **animals** and **plants**. He drew a flexi-fish as an example of an animal, and a funny looking thing as an example of a plant. The players have taken turns submitting new creatures so now the table looks like this:



When a player announces that she knows how the Biologist is deciding, she no longer participates in creating creatures. Instead she votes on all future creatures by holding up left or right hand depending on which column she thinks the Biologist will place the creature.

For every correct guess, a player gets 1 point. For every incorrect guess the player loses 1 point.

After 10 creatures have been added, the Biologist gets 2 points for each player who has started voting.

The game continues with a new Biologist. The new biologist should choose to take one of the groups described by a previous Biologist. For example, after the first Biologist described Plants and Animals, the second Biologist could split Plants into Flowers and Trees:

Pants	
Flowers	Trees

The game continues until everyone has had a chance to be the Biologist. The highest score wins.

### Variants:

1. A Biologist can name more than 2 groups.
2. Cladistics can also be played using the Galileo Box or any other set of manipulatives. For example, using triangles and hexagons:



### The Math in This Problem:

This brainteaser involves observing the composition of structures and discovering similarities among these various arrangements. Incorporating such a task into a fun and competitive game will surface enthusiasm out of the students in learning about different structural properties and relationships, which is an important introductory topic to applied mathematics.