Bio Math Connections
September 26, 2008

A phylogenetic tree is a tree that shows the evolutionary relationships between species. A number of different types of trees that can be made. For example rooted vs. unrooted, labeled vs. unlabeled, and bifurcating vs. multifurcating. The trees that we will be looking at today will be rooted, labeled, and bifurcating, meaning that our tree will have a common ancestor that all the species are rooted to. At each node (or point of division) there will be only two paths leading away from it. At the end of each pathway, the leaves of the tree will be labeled with the name of an organism.

The math connection to phylogenetic trees that we will be discussing is the number of ways that a tree can be made. To start things off we will for our first example use three organisms.

a)   b)   c)

Platypus   American Dipper   Madagascar Hissing Cockroach

Everyone draw a rooted, bifurcating, and labeled tree for these three organisms.
How many different trees did we come up with? How many topologies (different shapes) did we come up with? Are they really different?
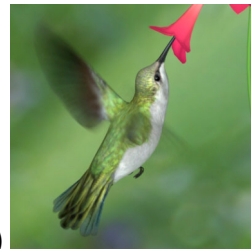
Now we will do the same thing with four species.

1.   b)   c)

Brown Recluse   Luna Moth   Humming Bird

d)

Ring Snake

Everyone draw a rooted, bifurcating, and labeled tree for these four organisms.
How many different trees did we come up with? How many topologies (different shapes) did we come up with? Are they really different?

Now let's try five organisms.
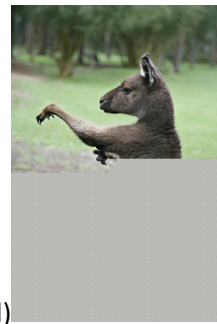

a) Gray Wolf

b) Tasmanian Devil

c) Ferret

d) Kangaroo

e) Donkey

Everyone draw a rooted, bifurcating, and labeled tree for these three organisms.

How many different trees did we come up with? How many topologies (different shapes) did we come up with? Are they really different?

Now how many different trees can be made for n species?