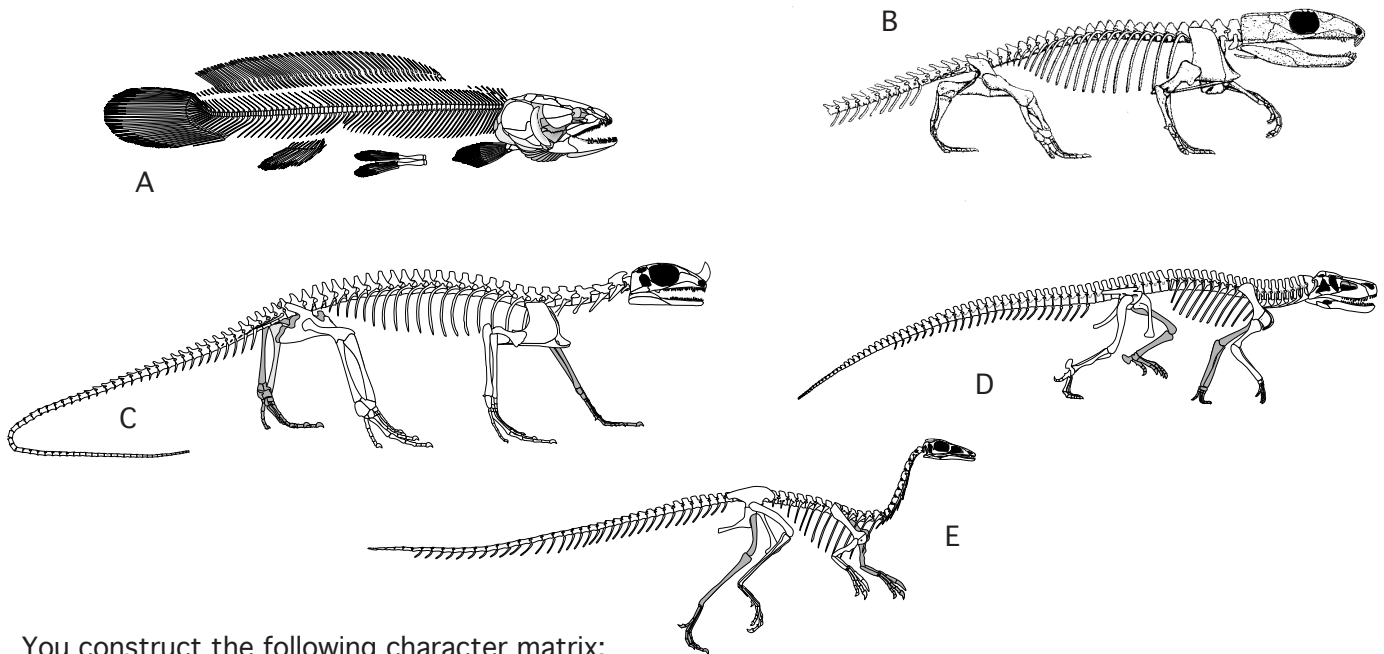


Lab Exercise 4
Parsimony Analysis

You have discovered the skeletons of five new fossil animals, and you would like to investigate their phylogenetic relationships.

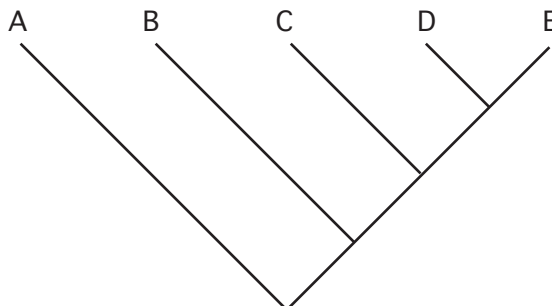
After being told that species "A" is very primitive, you decide to use it as the outgroup for a phylogenetic analysis.



You construct the following character matrix:

	A	B	C	D	E
1. Orbit	yes	yes	yes	yes	yes
2. Forelimb and hindlimb with digits	no	yes	yes	yes	yes
3. Infratemporal fenestra	no	no	yes	yes	yes
4. Antorbital fenestra	no	no	no	yes	yes
5. Mandibular fenestra	no	no	no	yes	yes
6. Bipedal	no	no	no	no	yes
7. Horn at tip of snout	no	no	yes	no	no

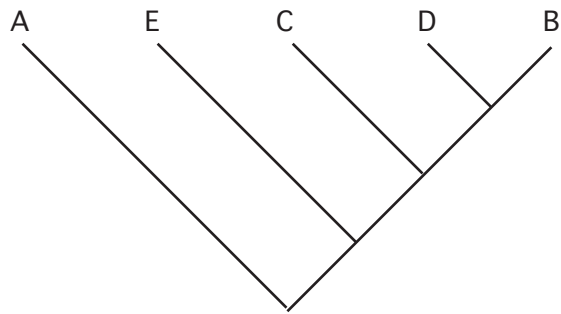
The cladogram below is generated:



1. Mark the most parsimonious character state transformations on the cladogram.

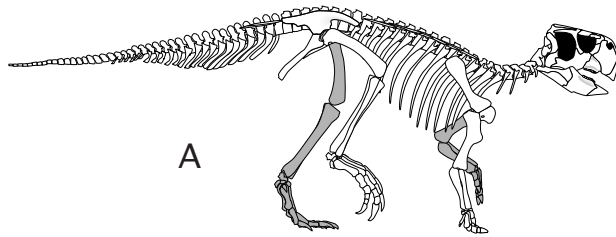
2. Which character state is present in all five taxa? Does it reveal anything about these creatures' relationships?
3. Which derived character states are found in only one terminal taxon? Do they reveal anything about these creatures' relationships?
4. Which derived character states are shared by more than one, but not all, terminal taxa? Do these reveal anything about relationships?
5. How many character state changes are needed on this cladogram?

Suppose someone proposes a different cladogram for these animals:

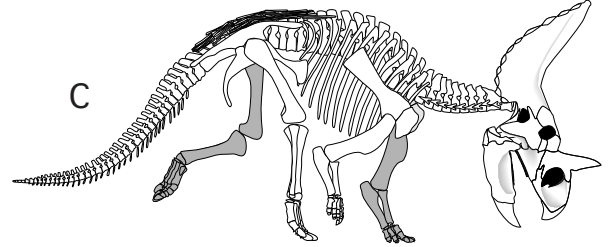


6. Map the character state changes onto this cladogram.
7. How many character state changes are needed on this cladogram?
8. Which of the two cladograms is preferred?
9. What was the basis for your decision?

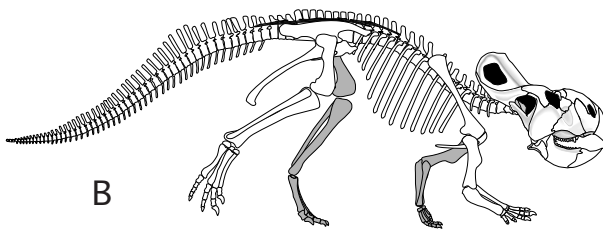
10. Now YOU do it. Four animals are shown below, along with a list of characters that might help us understand their phylogenetic relationships. Indicate whether the indicated character state is present or not and show the most parsimonious tree. Animal A is the outgroup.



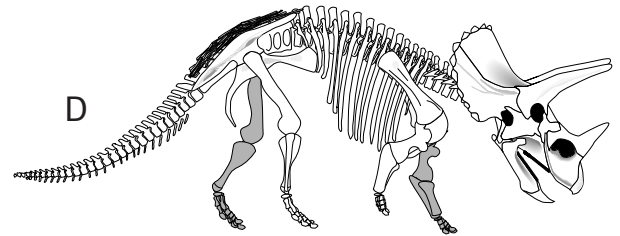
A



C



B



D

A

B

C

D

1. Teeth missing from front of mouth
2. Bony frill along back of skull
3. Large horn on tip of snout
4. Large horns above eyes
5. Large hole on surface of bony frill