

The Great Clade Race

Based on: D. W. Goldsmith (2003) American Biology Teacher 9: 679-682

Imagine a race through the woods with six runners (A-F). All the runners start at a single starting line but at various places the course forks, and runners are free to choose either path. The paths never converge again (once two runners pick different paths they can never meet up again). To help keep track of the race, each runner carries a card that gets stamped at check-in stations distributed at various places in the course. The following rules apply:

- Runners cannot backtrack
- Runners are obligated to collect a stamp from each check-in station they pass
- Each check-in station uses only one stamp
- No two check-in stations use the same stamp

All six runners finish the race carrying their cards, but they each cross a different finishing line. The aim is to use the information in the cards collected from the six runners to reconstruct the course and the placement of check-in stations.

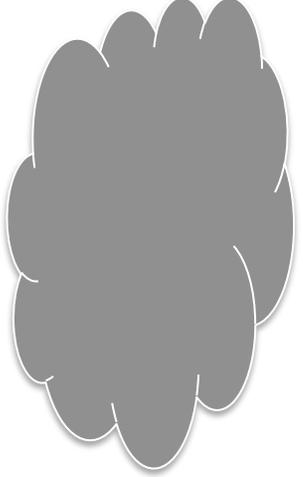
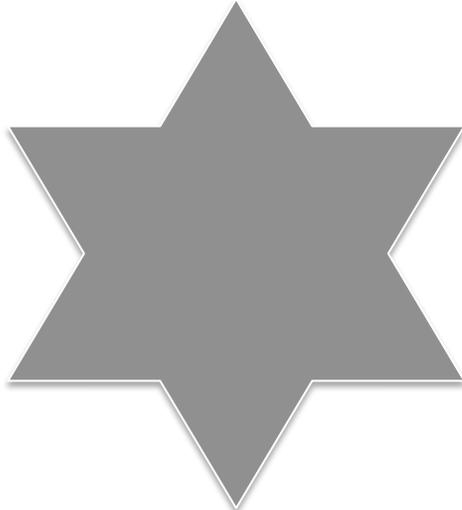
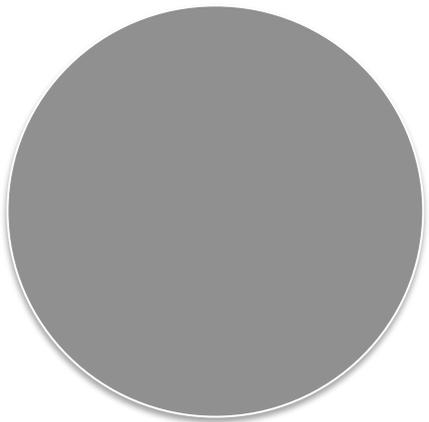
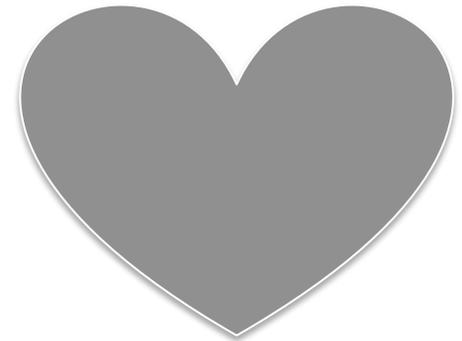
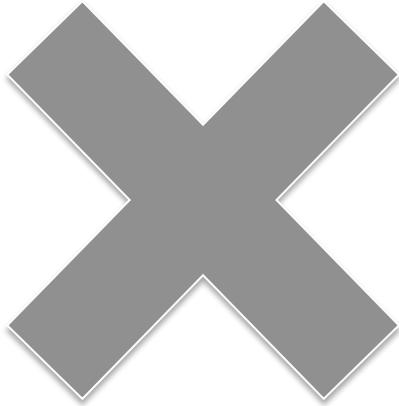
Draw a map of the course. Labeling the starting point, each check-in station (with the symbol of the stamp it uses), and each finishing line (with the letter of the runner who emerges there).

Compare your map to those generated by other groups. How are they similar? How do they differ?

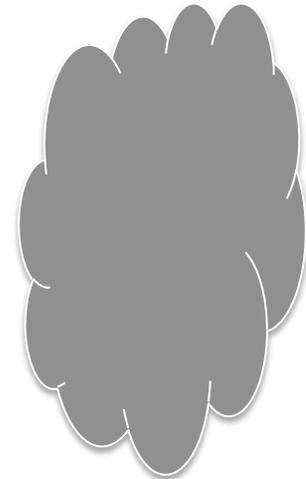
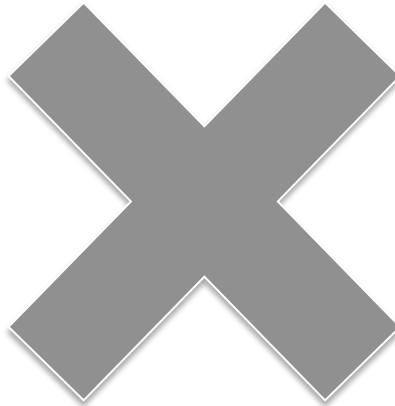
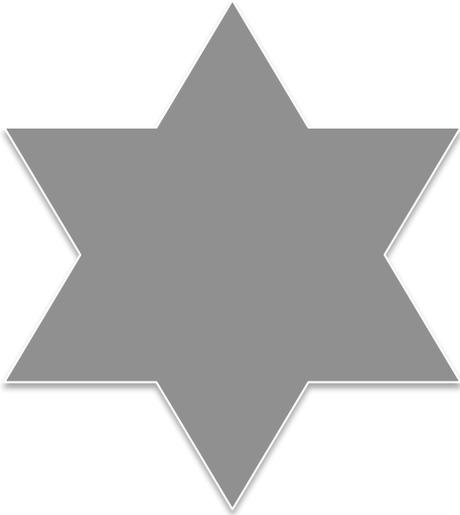
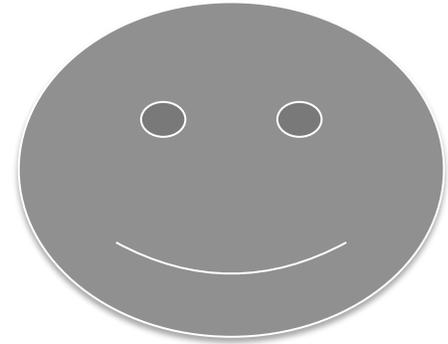
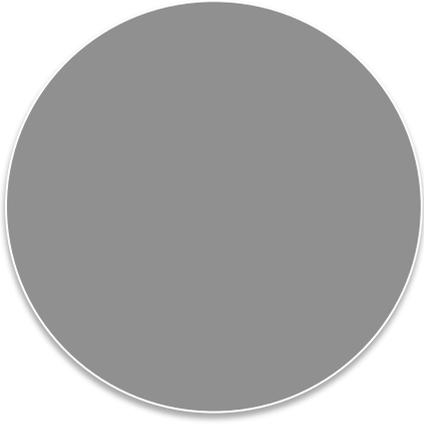
Discuss the following questions:

- a) In thinking about the analogy to evolution, what would the following represent?
 - a. The runners
 - b. The check-in stations
 - c. The race course
- b) What can you infer about the shape of the tree? Did a particular path go right or left? Are paths straight or not? Are some segments of the course longer or shorter than others?
- c) When there were two check-in stations on a segment, can you figure out which came first?
- d) In the biological case, when is it valid to assume that each “runner” runs the same total distance?
- e) In the biological case, is it valid to assume that the “runners” receive a blank card at the start and that they always gain, but never lose, stamps?

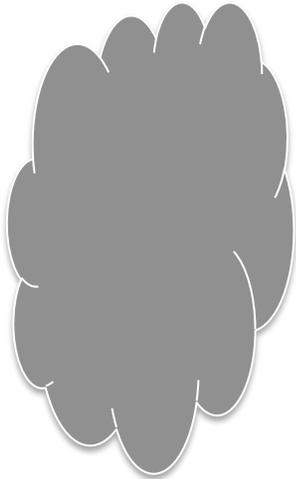
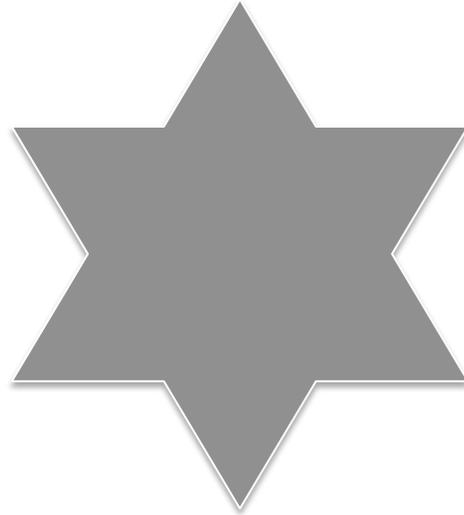
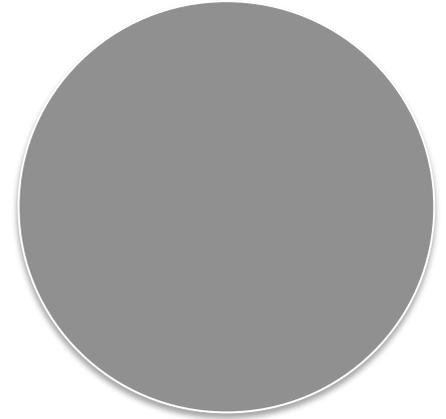
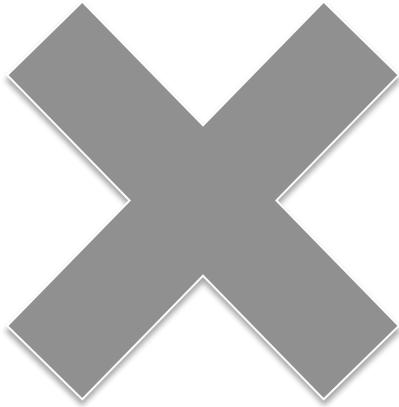
Runner A



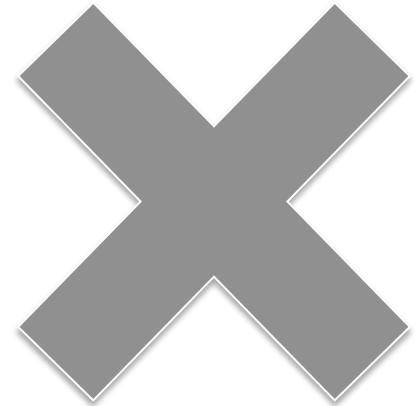
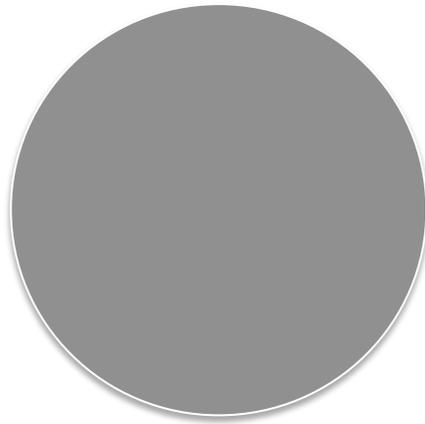
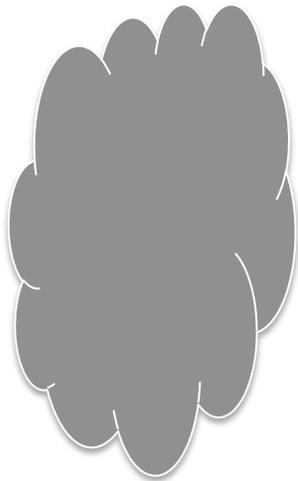
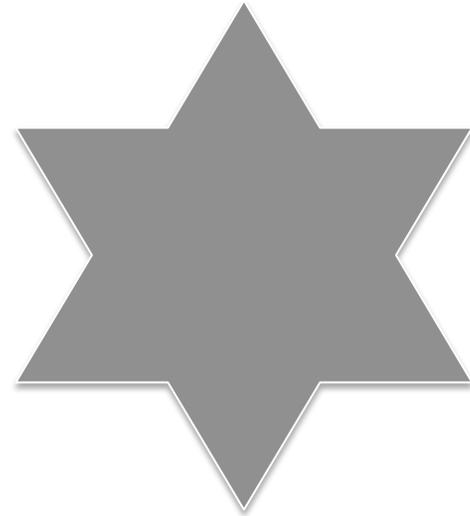
Runner B



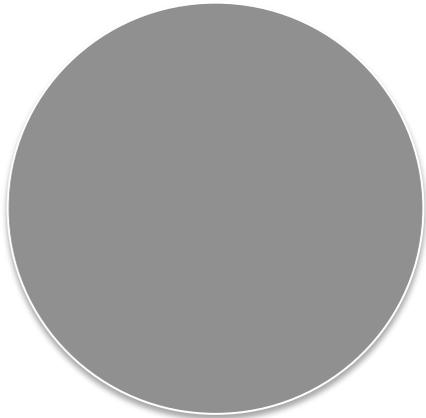
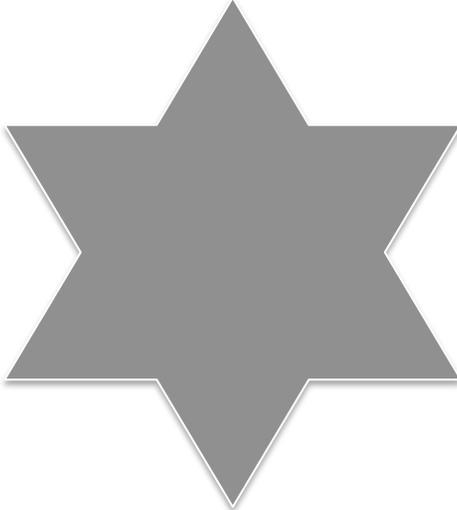
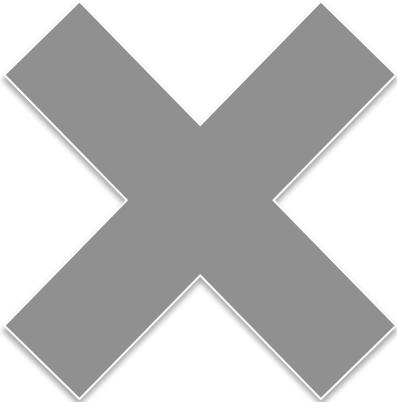
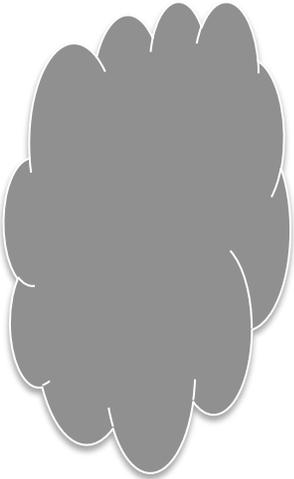
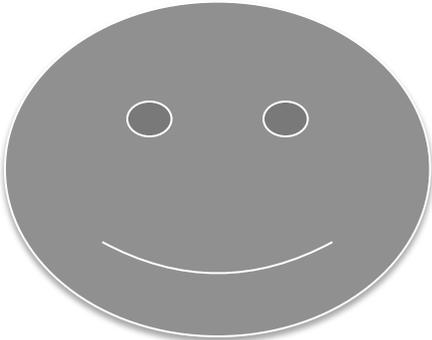
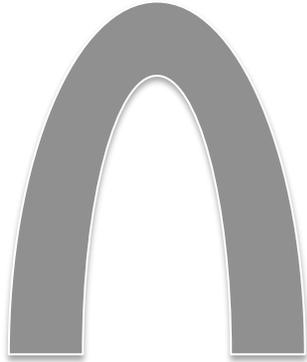
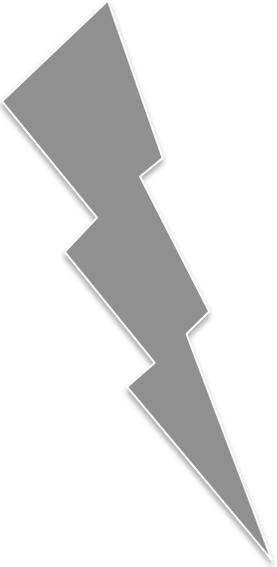
Runner C



Runner D



Runner E



Runner F

