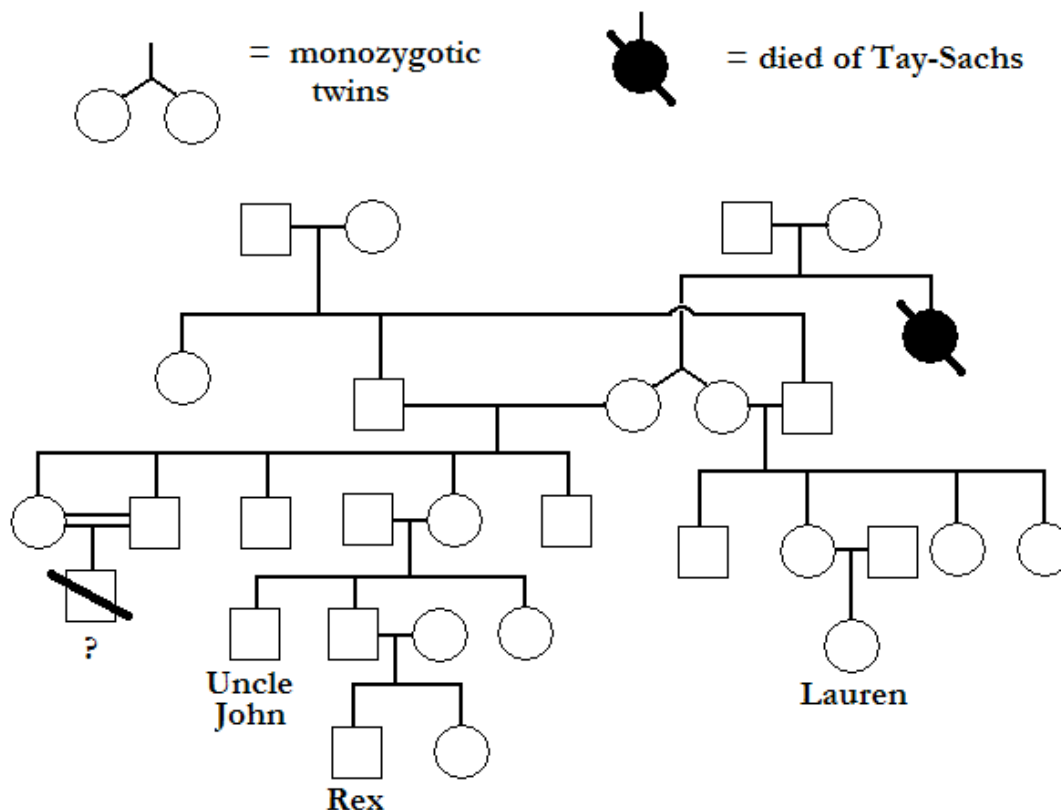


Pedigree Practice Question – USABO 2006

Use the family tree below. Express answers as simplified fractions.



- A) Tay-Sachs is a rare disorder which affects lipid metabolism; those affected die in early childhood. Based on this pedigree, how is Tay-Sachs disease inherited?
- B) Rex is Lauren's fiancé. One month before their wedding, he looked through some old documents and discovered the family tree above. He is concerned and comes to you for genetic counseling.
- If Rex and Lauren have a child, what is the likelihood that it will have Tay-Sachs?
- C) In Rex's grandmother's generation, there was an incestuous relationship. The resulting child, marked with a '?', died young under mysterious circumstances. If that child in fact had Tay-Sachs, what would your answer to B) now become?
- D) Rex and Lauren get married on the beach. After the ceremony, Rex's uncle John attempts to go swimming, but is caught in a current and swept away from shore. Lauren sees him struggling in the water and decides to rescue him.
- In performing this altruistic act, Lauren has some risk of dying herself. Assume that Rex's uncle will surely die if not rescued, and that if he lives, he is five times less likely to produce offspring than Lauren. Calculate their coefficient of relatedness r , and find the risk to Lauren below which Hamilton's rule supports her decision to rescue Uncle John.