From *Genetics* by Hartl and Jones

**Tetrad Analysis Tree for unordered tetrads**

- **PD=NPD?**
  - Yes: Conclude Unlinked
  - No: 100% PD?
    - Yes: Conclude closely linked genes
    - No: Any TT?
      - Yes: There are TTs, so crossovers have occurred
      - No: Double crossovers did occur
        - Yes: Conclude no double crossovers so single equation is adequate
        - No: Any NPD?
          - Yes: Map distance = \(\frac{1}{2}\frac{TT + 3NPD}{Total} \times 100cM\)
          - No: Map distance = \(\frac{1}{2}\frac{TT}{Total} \times 100cM\)

- PD=NPD?
  - No: Any TT?
    - Yes: At least one of the genes is not completely linked to its centromere
    - No: Both genes are closely linked to their centromeres
      - TT<2/3?
        - Yes: Then if one is known to be tightly linked to its centromere, the other must be this far from its centromere – \(\frac{1}{2}\frac{TT}{Total} \times 100cM\)
        - No: Double crossovers did occur
          - Yes: At least one of the genes is unlinked to its centromere
          - No: Conclude no double crossovers so single equation is adequate

Note: If crossovers take place between both genes and their centromeres, this equation does not hold. However, if there is a third centromere-linked gene segregating in the cross, one can solve three equations in three unknowns and obtain all three distances.