**Derivation of Equation 2b**

1. Begin with the time and distance at normal speed:

$$T=\frac{d\_{normal}}{v\_{normal}}$$

2. Substitute the proportions of slow and fast distance to equal the same total time:

$$\frac{d\_{fast}}{v\_{fast}}+\frac{d\_{slow}}{v\_{slow}}=T$$

3. Replace $d\_{fast}$ so there is only one unknown, based on the fact that $d\_{normal}=d\_{slow}+d\_{fast}$:

$$\frac{d\_{normal}-d\_{slow}}{v\_{fast}}+\frac{d\_{slow}}{v\_{slow}}=T$$

4. Multiply both sides by $v\_{fast}$:

$$d\_{normal}-d\_{slow}+\frac{d\_{slow}v\_{fast}}{v\_{slow}}=v\_{fast}T$$

5. Rearrange the equation so $d\_{slow}$ is on one side:

$$\frac{d\_{slow}v\_{fast}}{v\_{slow}}-d\_{slow}=v\_{fast}T-d\_{normal}$$

6. Isolate $d\_{slow}$ in 2 steps:

$$d\_{slow}\left(\frac{v\_{fast}}{v\_{slow}}-1\right)=v\_{fast}T-d\_{normal}$$

$$d\_{slow}=\frac{v\_{fast}T-d\_{normal}}{\frac{v\_{fast}}{v\_{slow}}-1}$$

7. Simplify the denominator:

$$d\_{slow}=\frac{v\_{fast}T-d\_{normal}}{\frac{v\_{fast}-v\_{slow}}{v\_{slow}}}$$

8. Multiply by the inverse of the denominator to simplify the equation to the final version:

$$d\_{slow}=\frac{v\_{fast}v\_{slow}T-d\_{normal}v\_{slow}}{v\_{fast}-v\_{slow}}$$