

Synodic Periods and Siderial Periods

P = period = time to complete one cycle

so $\frac{1}{P}$ = speed around an orbit = $\frac{1 \text{ orbit}}{P \text{ days}}$

The difference in speeds between two planets is

$$\frac{1}{P_1} - \frac{1}{P_2} \quad P_1 = \text{faster, shorter}$$

this is the relative speed, so the relative period is related as

$$\frac{1}{S} = \frac{1}{P_1} - \frac{1}{P_2}$$

S = "Synodic period"

$$\frac{1}{S} = \frac{1 \text{ meeting}}{S \text{ days}}$$