

Station Card: Eclipse Geometry

Why eclipses don't happen every month

Dr. Anna Rosen

Name: _____ Section: _____

Date: _____

Station: _____ Group members: _____

Goal: Use the demo to make a claim supported by (1) at least one number/readout and (2) at least one sanity check.

Demo: /demos/eclipse-geometry/

Demo setup: Use **New Moon** and **Full Moon** buttons; drag near/far from nodes.

Tip: Click **Station Mode** to add snapshot rows and print/copy your table.

Your station artifact (fill in): 1) **Control(s):** phase angle Δ , node proximity (nearest-node distance or $|\beta|$), tilt i

2) **Observable(s):** eclipse type (none/partial/central; penumbral/umbral/total)

3) **Governing relationship:** write “eclipse requires syzygy + small $|\beta|$ ” in words

4) **Sanity check:** what happens when $i = 0^\circ$?

5) **Connection sentence:** “This connects to angular size because...”

Word bank + sanity checks

Word bank: - **Syzygy:** Sun–Earth–Moon aligned (New Moon for solar eclipses; Full Moon for lunar eclipses). - **Node:** where the Moon’s orbit crosses the ecliptic plane. - **Ecliptic latitude β (degrees):** how far the Moon is above/below the ecliptic plane. - **Inclination i (degrees):** tilt of the Moon’s orbit relative to the ecliptic plane. - **Near a node:** small $|\beta|$ (and/or small “nearest node” distance) at syzygy.

Sanity checks: - You need BOTH: (1) New/Full Moon and (2) near a node (small $|\beta|$). One condition alone is not enough. - If $i = 0^\circ$, then $\beta = 0^\circ$ always \rightarrow eclipses happen every month. - Changing Earth–Moon distance can change whether a solar eclipse is total or annular (size matters too).