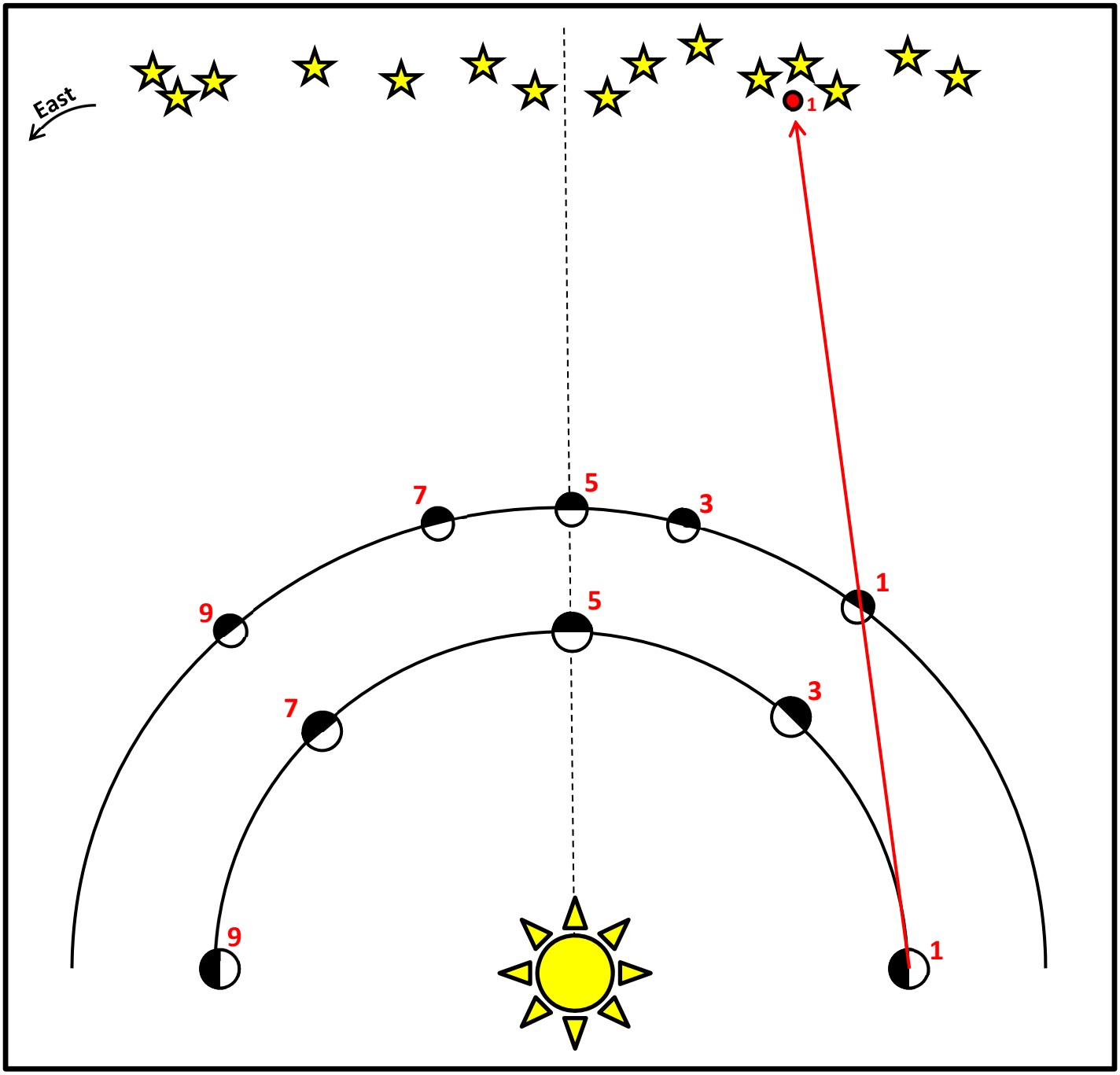
Astronomy Demonstration Video – Retrograde Motion – Worksheet

to follow viewing of the astronomy demonstration video at

https://www.youtube.com/watch?v=1nVSzzYCAYk

A. Retrograde Perspective – Directions: The diagram below illustrates the positions of Earth and Mars at 5 different times. They are chronologically labeled by a number, but only the odd-numbered times are shown.

- Draw perspective arrows illustrating the apparent position of Mars among the background stars in the sky. A ruler will be helpful. The first has been completed for you – with the number label.
- Add the positions of Earth and Mars appropriate for the four missing even-numbered times and draw the arrows indicating the apparent positions of Mars for these perspectives. Include all numeric labels.
- Sketch the apparent path of Mars among the stars connecting your 9 data points in chronological order.



B. Parameters Describing Retrograde Motion

Planet	Distance from Sun (AU)	Synodic Period (days)	Retrograde Interval (days appearing to move west)	Retrograde Loop Angular Size (°)
Mars	1.5	780	72	15.9
Ceres				
Jupiter	5.2	399	121	9.9
Saturn	9.5	378	138	6.8
Uranus	19.2	370	151	4.0
Neptune	30.1	367	158	2.8
"Far Out"	> 200			

Directions: This table provides data on the retrograde motion of superior planets. Please annotate the table as directed.

i) Crudely estimate the missing table values for the dwarf planet Ceres (2.8 AU from the sun).

ii) Accurately estimate the missing values for the hypothetical planet in a very large orbit entitled "Far Out" (>200 AU from the sun).

Hint: One perceptive student wrote "0°– No Loop" in the table's last box and drew the diagram below with the following explanation: "I don't think Far Out really makes a loop in the sky. It orbits so far from the sun that it moves extremely slowly and we can ignore its motion – Earth passes it quickly – which isn't true with Mars and the Jovian Planets. So effectively Far Out spends half of the year appearing to move eastward and half appearing to move westward."

Use this student's thinking to help you gain confidence in your Far Out answers. You might try holding up a pencil and pointing it to simulate the changing apparent location of Far Out as Earth orbits the Sun.