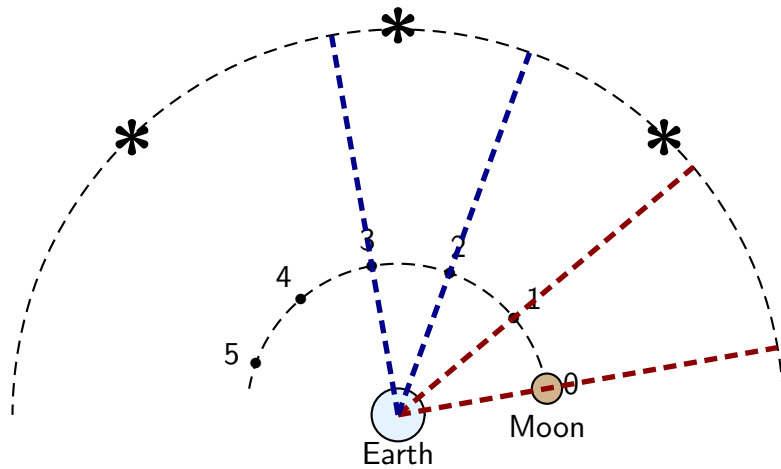


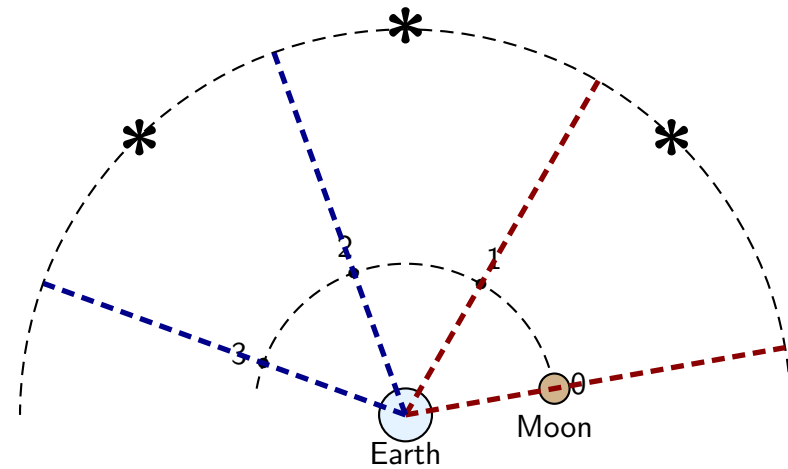
# Moon's Motion: Angular Rate

Trace the apparent position of Moon as viewed from Earth.

Constant slower angular rate

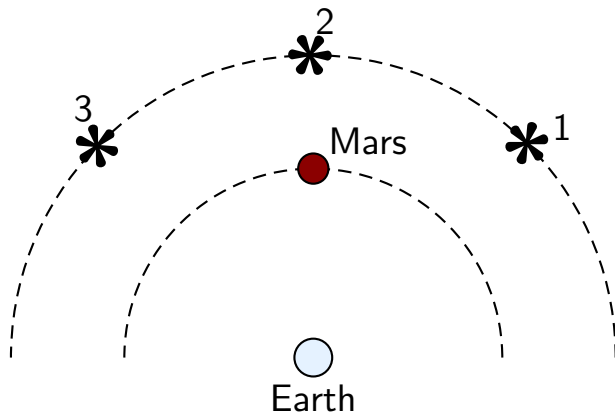


Constant faster angular rate



# Question 1

In a geocentric model, Earth, Mars and the background stars are aligned as illustrated on one day.



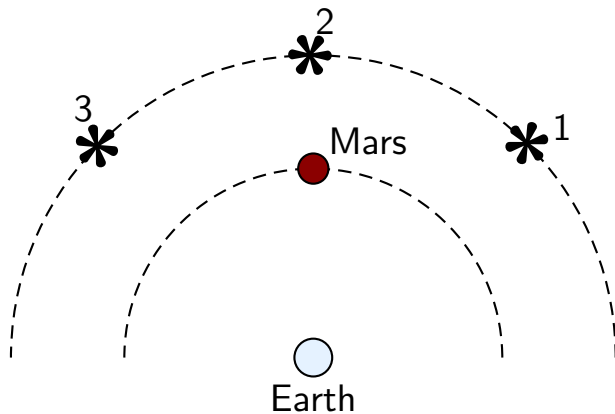
Suppose that Mars and the stars orbit clockwise.

Assuming that Mars and the stars orbit clockwise at the same rate (i.e. every day they cover the same angle), which of the following is true about Mars *viewed from Earth as the days pass*?

1. Mars aligns with the same background star.
2. Mars aligns with different background stars (in order  $1 \rightarrow 2 \rightarrow 3 \dots$ ).
3. Mars aligns with different background stars (in order  $3 \rightarrow 2 \rightarrow 1 \dots$ ).
4. Mars aligns with various background stars but the pattern is random.

## Question 2

In a geocentric model, Earth, Mars and the background stars are aligned as illustrated on one day.



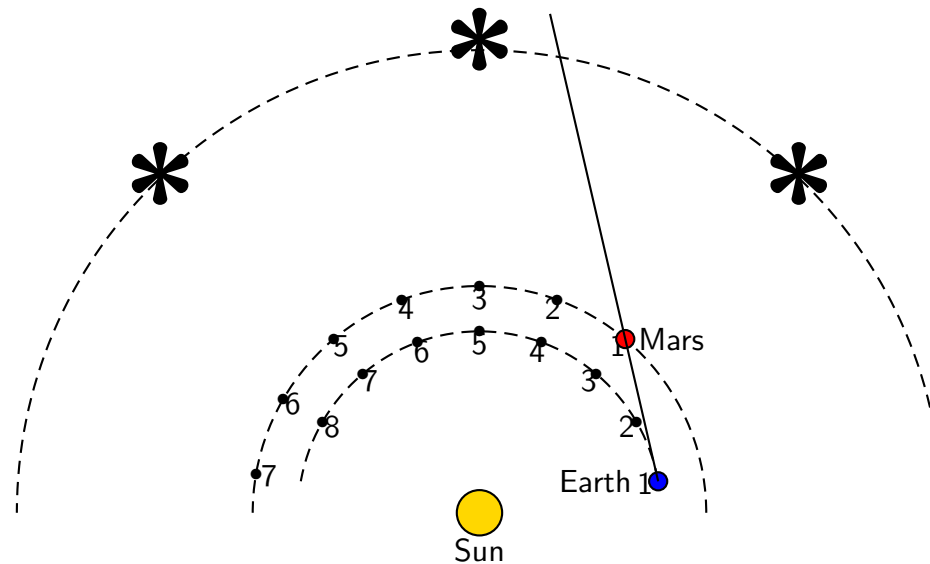
Suppose that Mars and the stars orbit clockwise.

Assuming that Mars and the stars orbit clockwise but Mars does so at a faster rate than the stars, which of the following is true about Mars *viewed from Earth as the days pass*?

1. Mars aligns with the same background star.
2. Mars aligns with different background stars (in order  $1 \rightarrow 2 \rightarrow 3 \dots$ ).
3. Mars aligns with different background stars (in order  $3 \rightarrow 2 \rightarrow 1 \dots$ ).
4. Mars aligns with various background stars but the pattern is random.

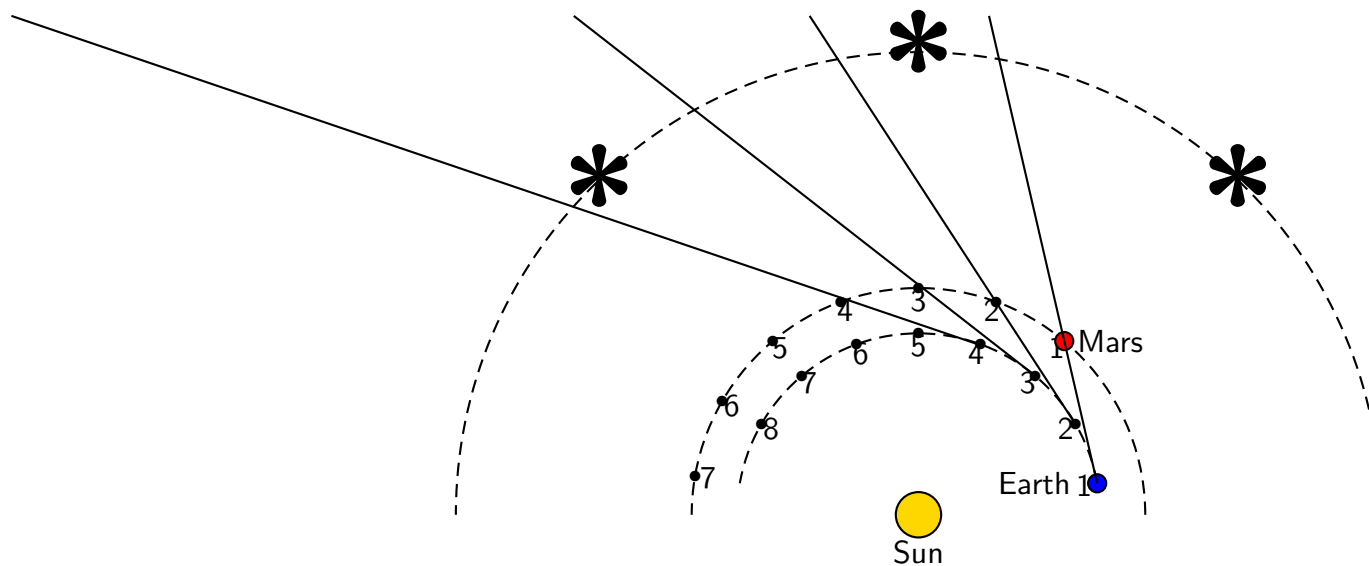
# Mars and Earth in a Heliocentric Model: Same Rates

Tracing the apparent position of Mars as viewed from Earth. First instant.

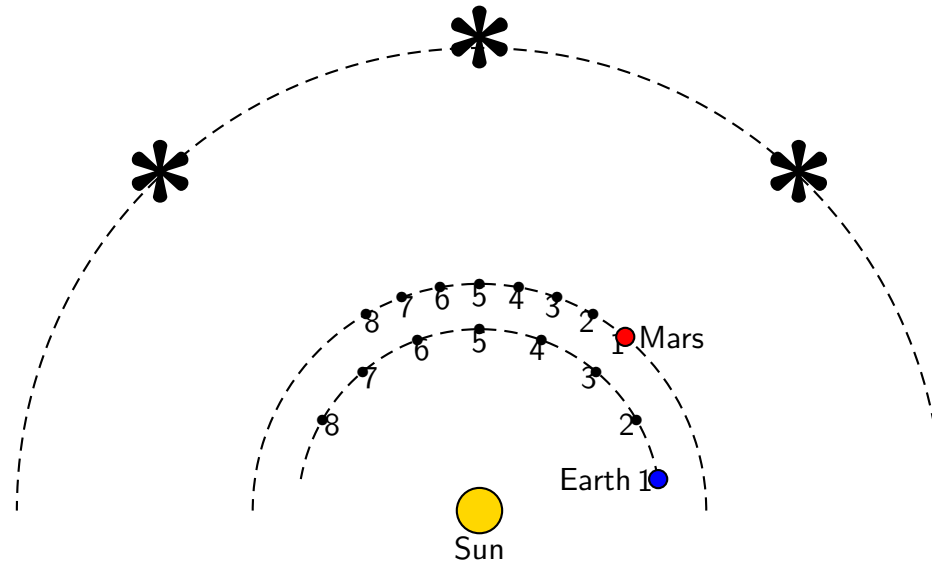


# Mars and Earth in a Heliocentric Model: Same Rates

Tracing the apparent position of Mars as viewed from Earth. First and later instants.

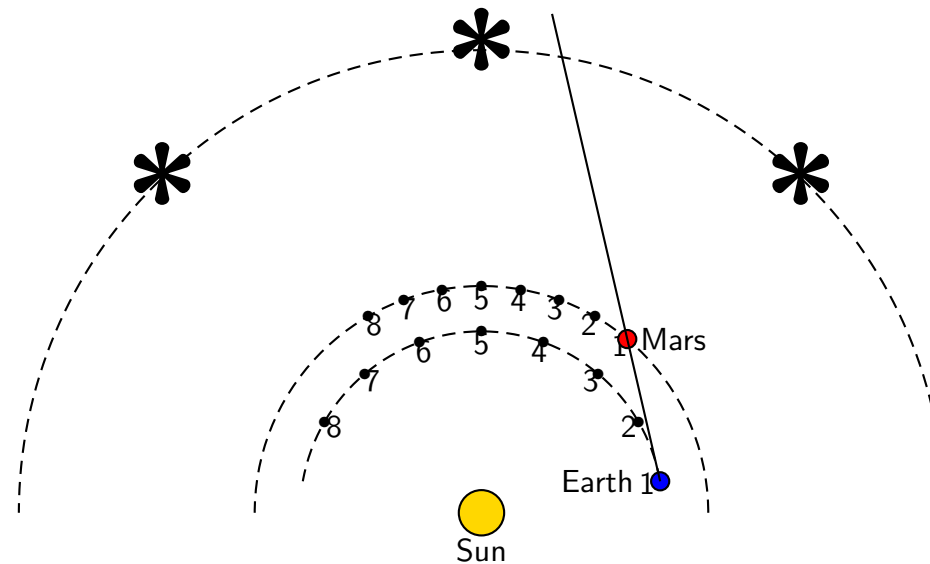


# Mars and Earth in a Heliocentric Model: Different Rates



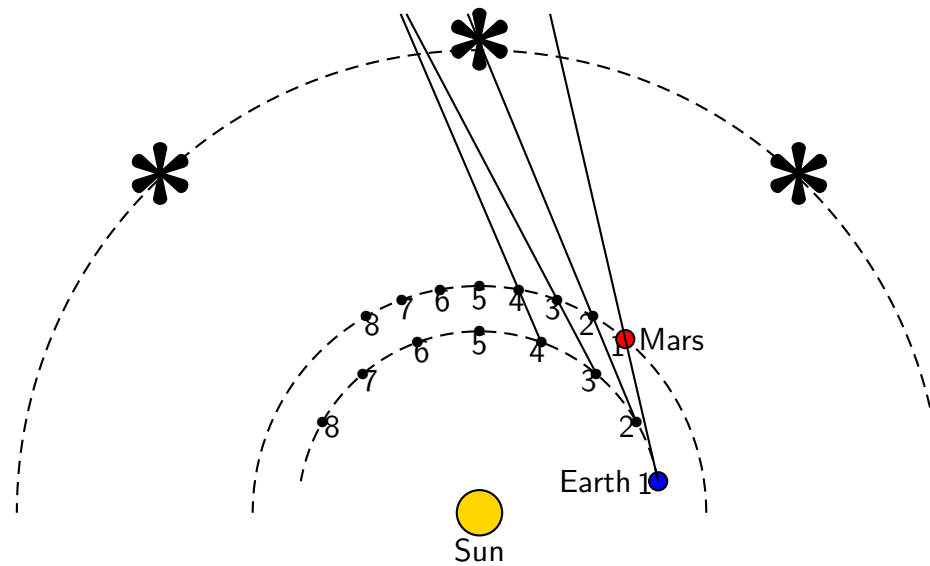
# Mars and Earth in a Heliocentric Model: Different Rates

Tracing the apparent position of Mars as viewed from Earth. First instant.



# Mars and Earth in a Heliocentric Model: Different Rates

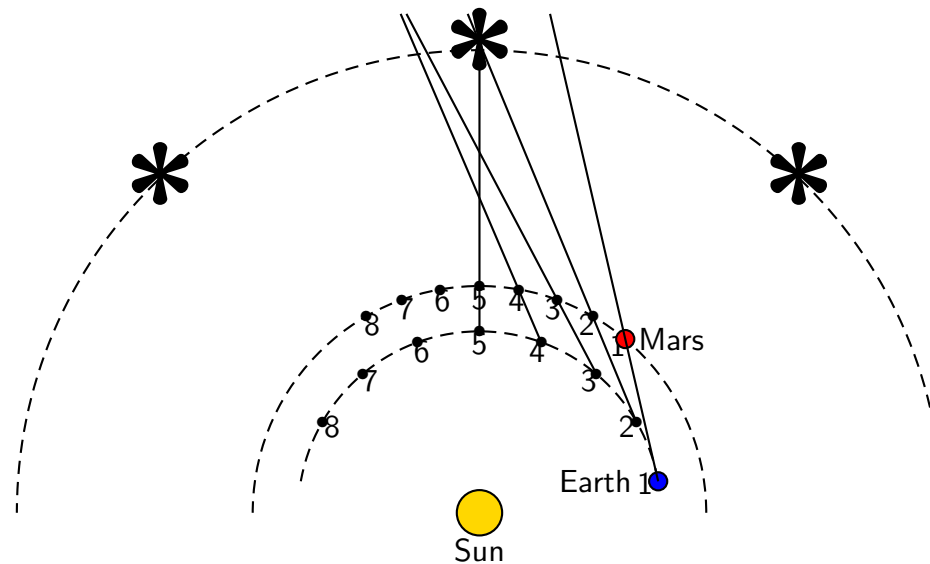
Tracing the apparent position of Mars as viewed from Earth. First, second, third and fourth instants.





# Mars and Earth in a Heliocentric Model: Different Rates

Tracing the apparent position of Mars as viewed from Earth. First to fifth instants.



# Mars and Earth in a Heliocentric Model: Different Rates

Tracing the apparent position of Mars as viewed from Earth. Retrograde motion during fourth to sixth instants.

