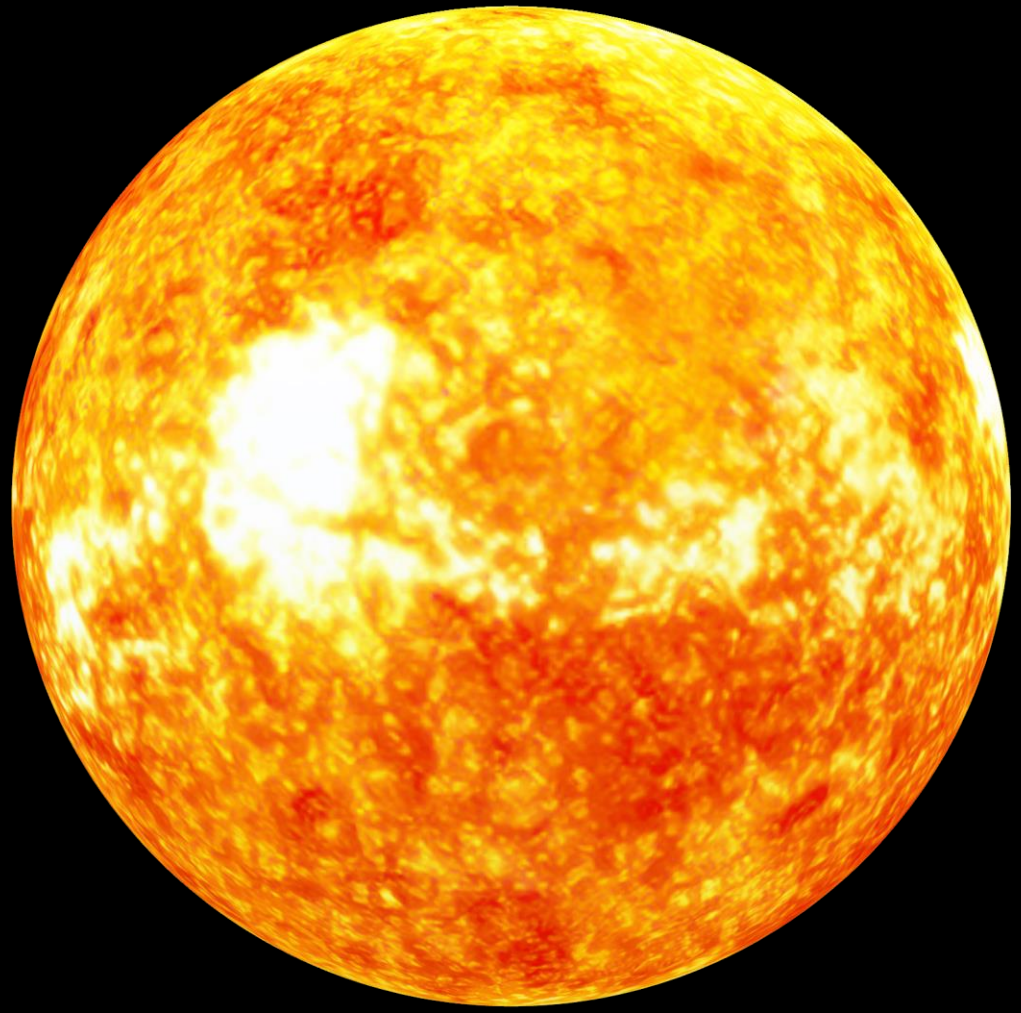

Solar Rotation

What do you know about the Sun?

Let’s find out with a quiz…

The sun was formed from a cloud of gas and dust, pulled together by which force?

A. Electrostatic
B. Tension
C. Gravity

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What stage of its lifecycle is the Sun currently in?

A. Main sequence
B. Red giant
C. White dwarf

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What type of reactions take place within the Sun?

A. Nuclear Fusion
B. Nuclear Fission
C. Combustion

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What are the dark areas on the Sun called?

A. Sun pimples
B. Sunspots
C. Solar freckles

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A. Sun pimples

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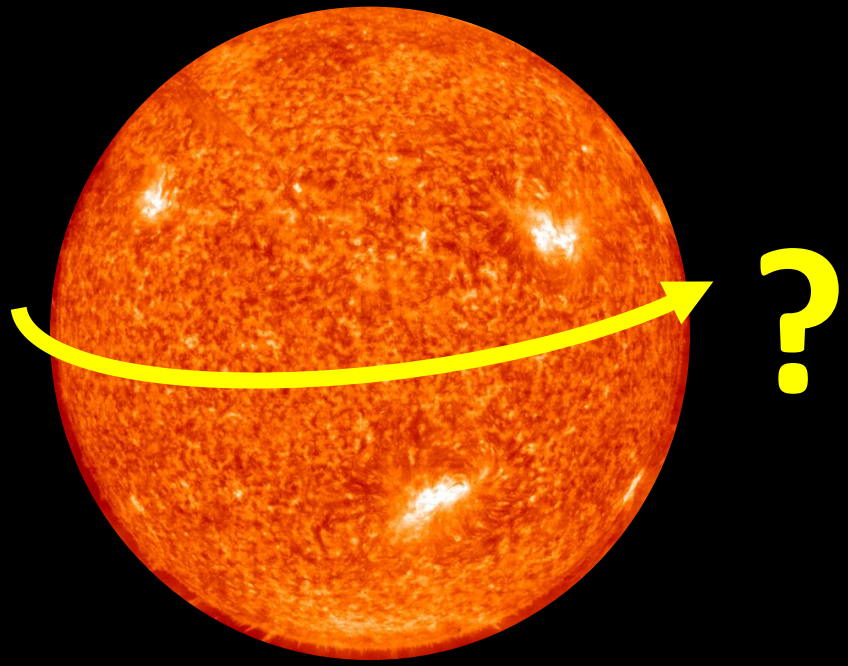
How long is a solar day?

24 hours



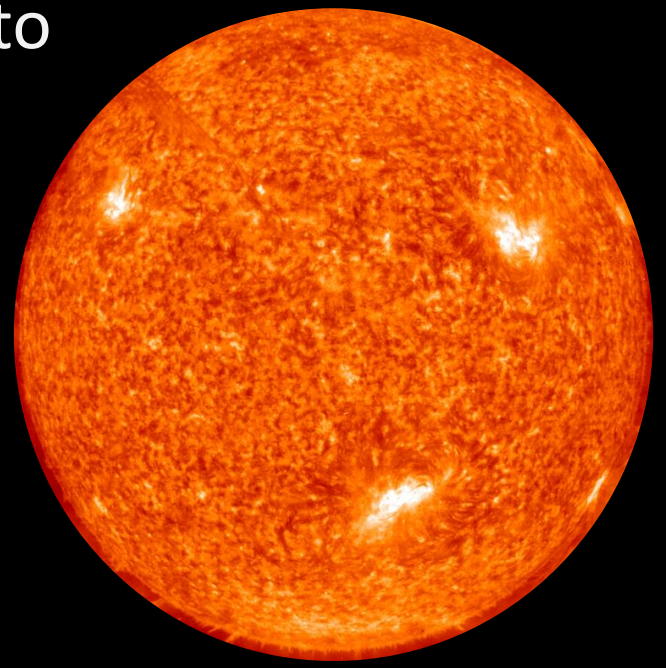
You are going to find out…

Lesson objectives

1. You will use real data from the Solar Dynamic Observatory to **observe the movement of a sunspot over time.**

2. You will apply the information from your observation to **estimate how long it takes the Sun to rotate once.**

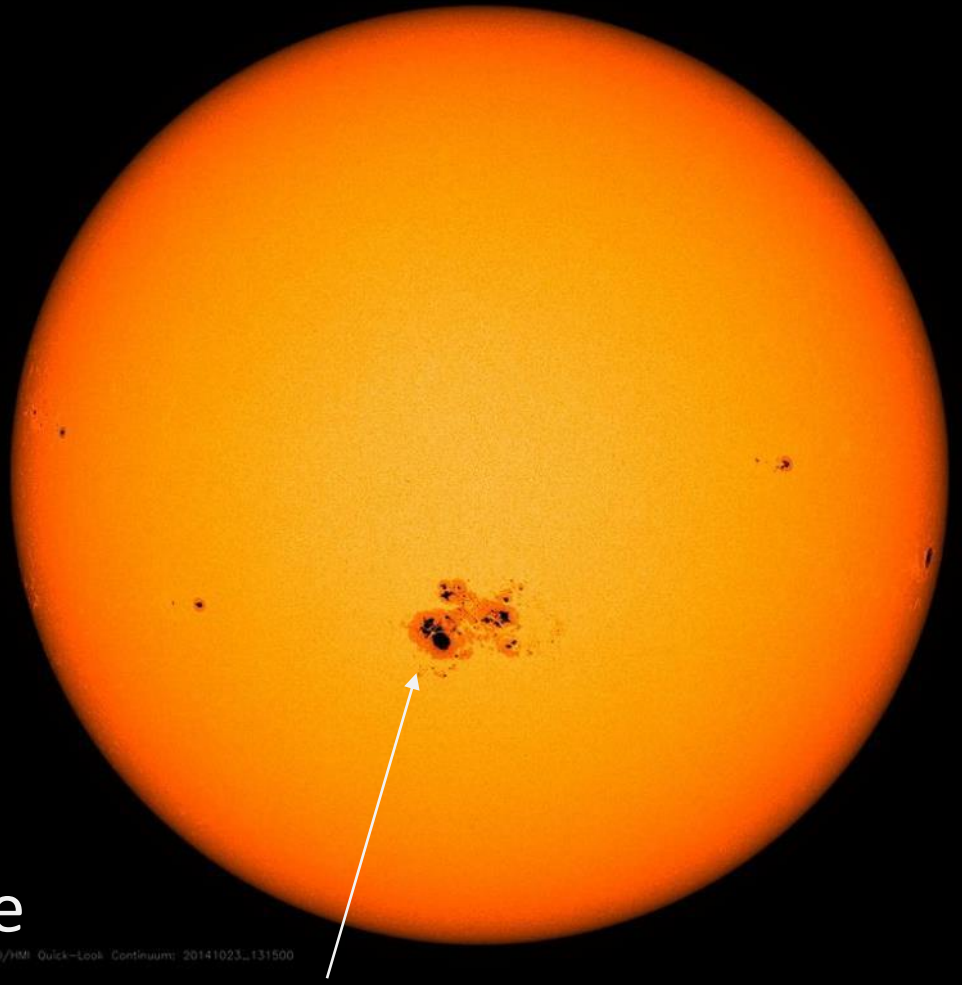
3. You will the use the true value of a solar day to **evaluate the success and limitations of your result.**



Solar Dynamics Observatory

What are sunspots?

- Dark areas of the Sun's photosphere that are cooler than the plasma around them (they are still very hot – around 4000 °C!).
- They often appear in pairs and may last for a few days to a few months.
- They have been observed since ancient times, but the invention of the telescope allowed astronomers to know that they rotated with the Sun.



The largest sunspot observed - 80,000 miles across

Credit: NASA/SDO

Use the Activity Sheet to…

1. Get your data from the SDO data archive
2. Measure the angle your sunspot has travelled around
3. Estimate the rotation period of the Sun (a solar day)

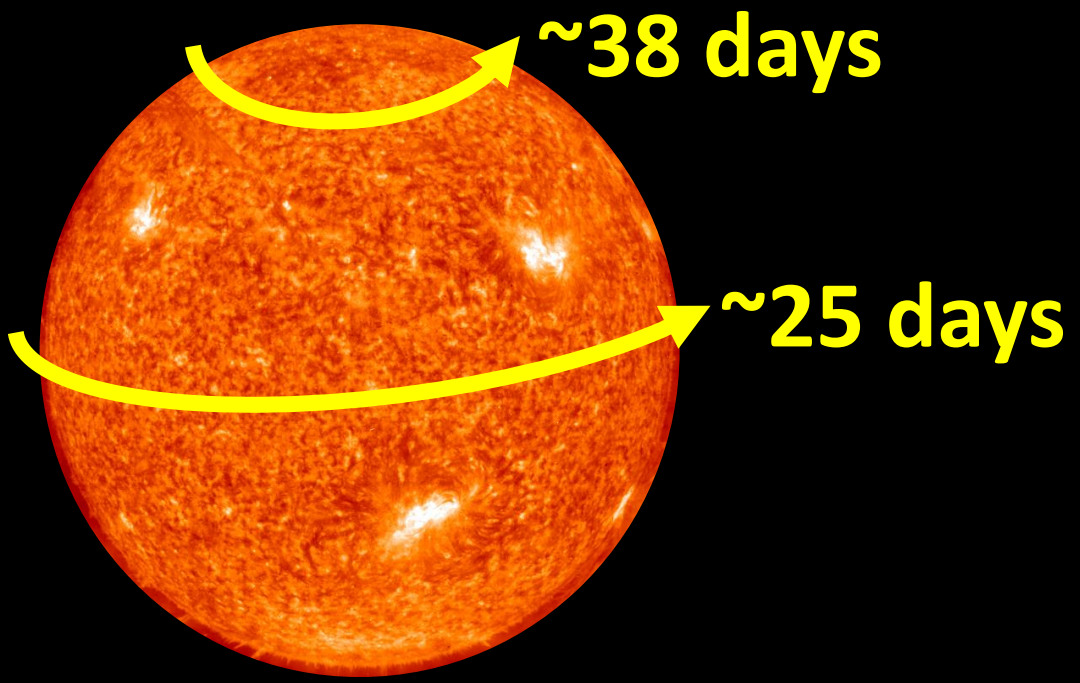
If you finish, have a go at the extension task on the Activity Sheet

Discussion

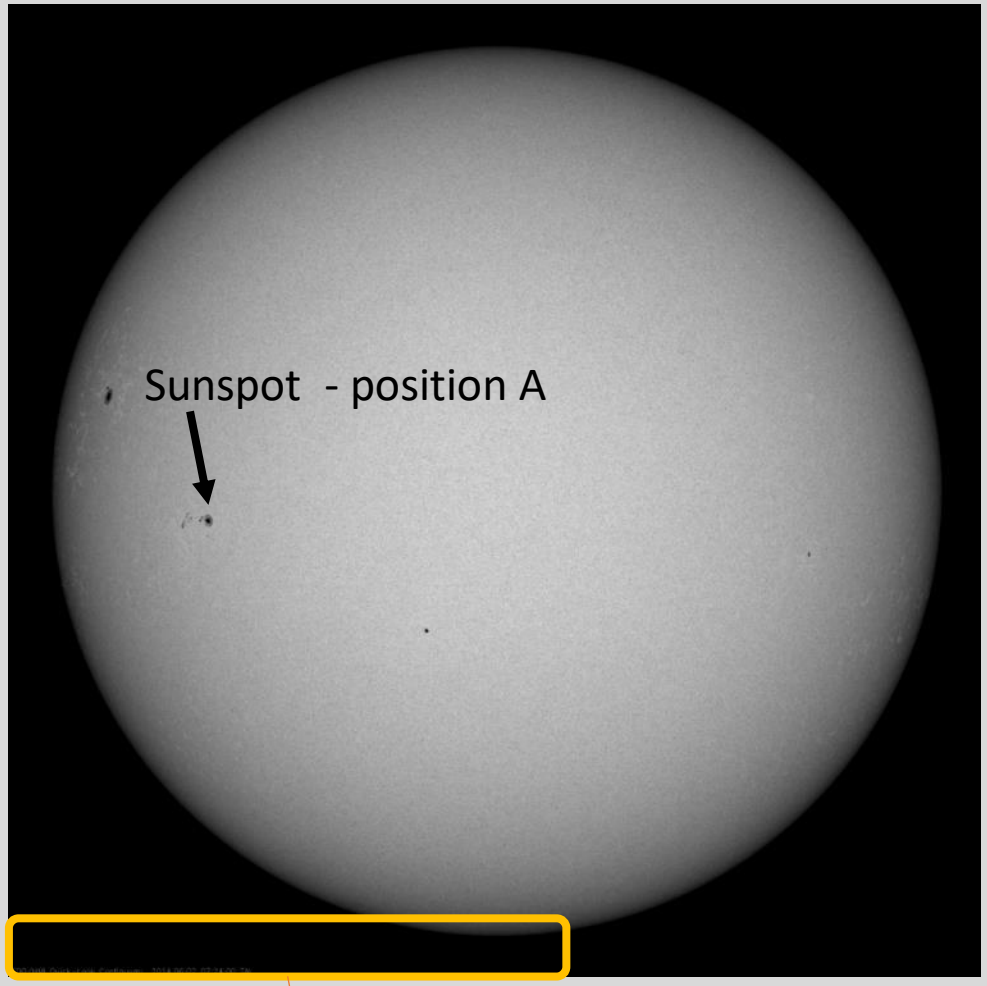
Share your results

How close is your estimate to the true value?

Why might your results differ?



Observe a sunspot over time



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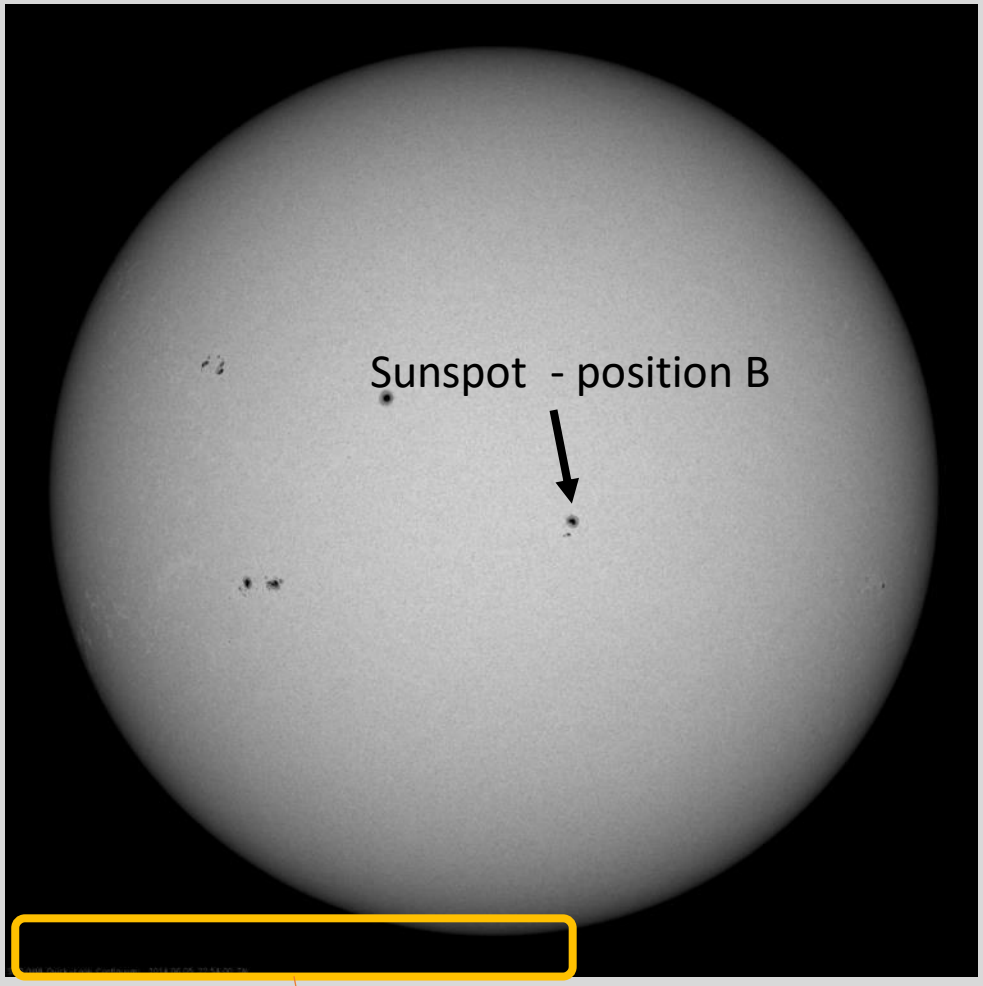

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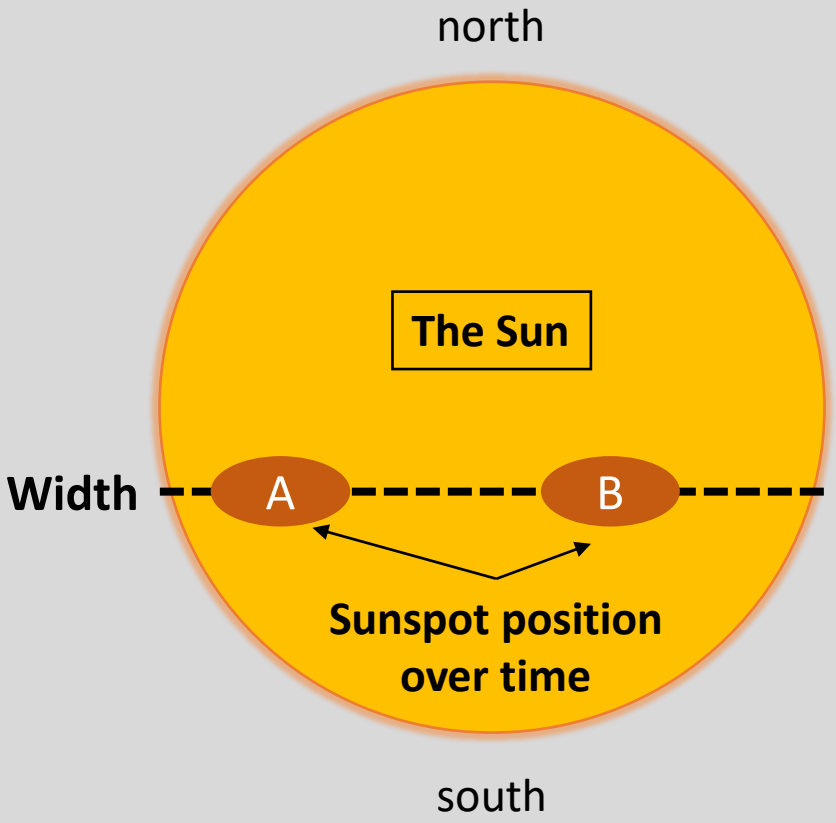
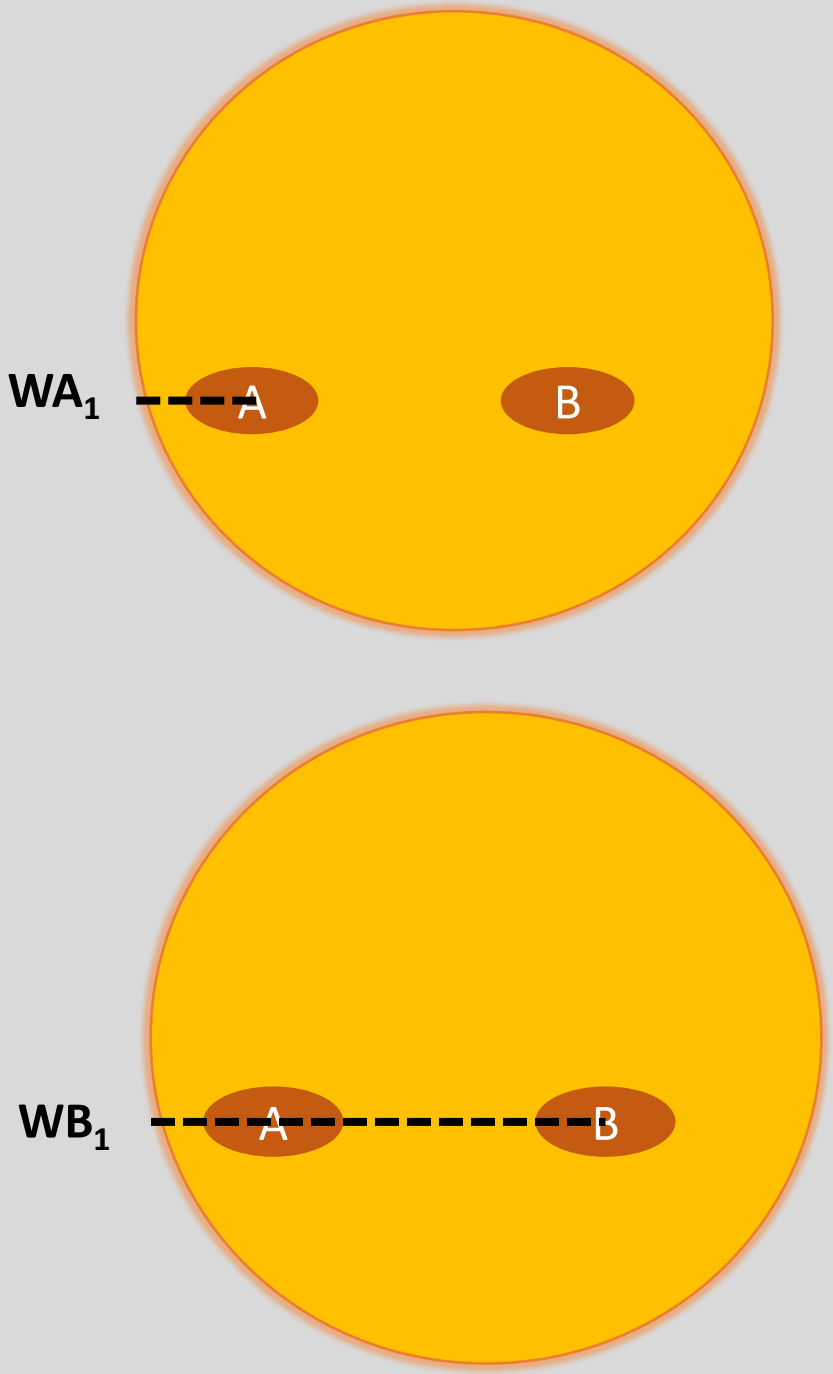
Measure W, WA_1, and WB_1



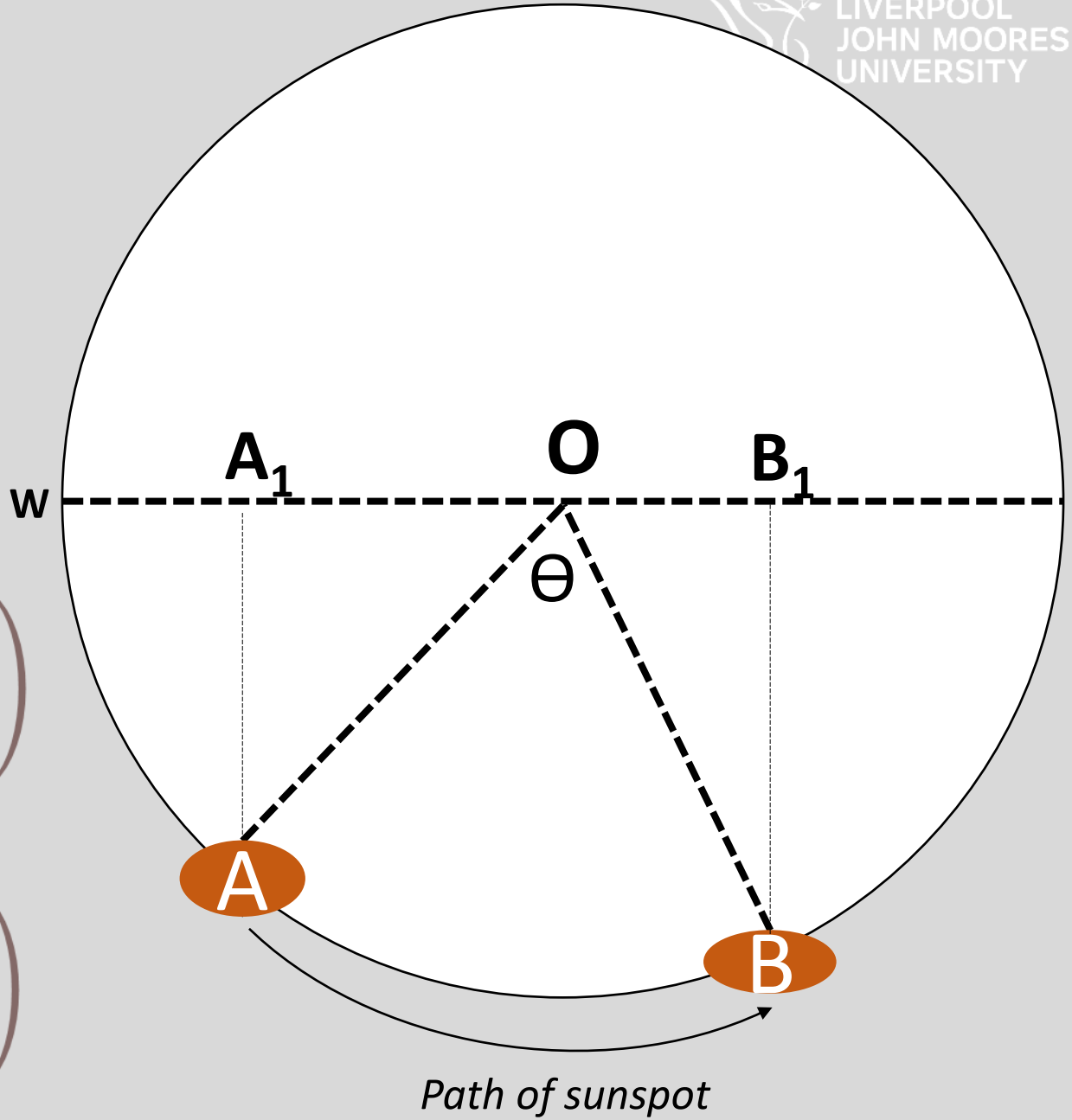


Calculate angle AOB

$$AOB = WOB - WOA$$

$$WOB = cos^{-1}\left(\frac{W - (2 \times WB_1)}{W}\right)$$

$$WOA = cos^{-1}\left(\frac{W - (2 \times WA_1)}{W}\right)$$



Estimate the time is take the Sun to rotate once

$$Rotation\ period = \left(\frac{Angle\ AOB}{360}\right) \times time\ taken\ to\ move\ from\ A\ to\ B$$