

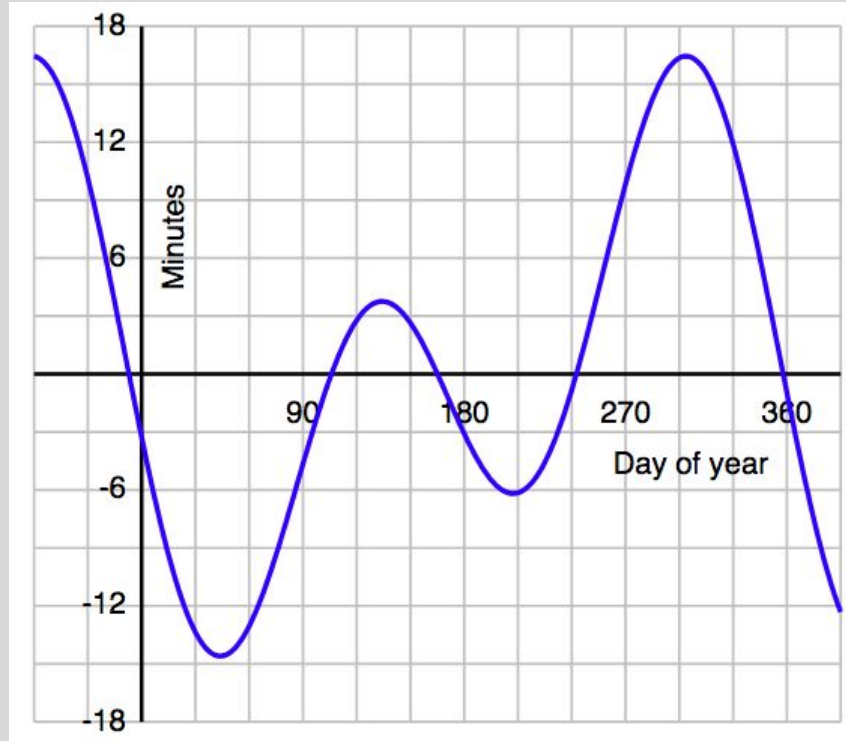
# 4. Time and the Earth Moon Sun Cycles (Part 1 - Equation of Time)

Edexcel GCSE Astronomy Course  
(Taught Concepts Only Sept 2020)

4.4 Be able to use the

$$\text{Equation of Time} = \text{Apparent Solar Time (AST)} - \text{Mean Solar Time (MST)}$$

Tasks:



# Why the correction is needed:

The shape of the EOT curve is a result of superposition of two sine curves:

- 1) One of period half a year due to the tilt of the Earth's axis - near the equinoxes the Sun's apparent motion (from Earth) has more vertical component (in declination) than horizontal (in RA) and therefore moves relatively slower than the mean; near the solstices the apparent motion is more horizontal (in RA) increasing the rate of motion along the celestial equator and appearing faster than the mean Sun - hence the semi-annual period.
- 2) The eccentricity of the orbit adds an annual component - the interference pattern of both curves gives the EOT

## References on EOT:

[https://www.youtube.com/watch?v=rRHhO7Wj4Ik&ab\\_channel=ScienceOnline](https://www.youtube.com/watch?v=rRHhO7Wj4Ik&ab_channel=ScienceOnline)

[https://en.wikipedia.org/wiki/Equation\\_of\\_time#:~:text=The%20equation%20of%20time%20describes,of%20%22reconcile%20a%20difference%22.&text=Apparent%20solar%20time%20can%20be,limited%20accuracy](https://en.wikipedia.org/wiki/Equation_of_time#:~:text=The%20equation%20of%20time%20describes,of%20%22reconcile%20a%20difference%22.&text=Apparent%20solar%20time%20can%20be,limited%20accuracy)

See the past paper questions on how to apply the knowledge to problems.

# Shadow sticks

4.19 Be able to use shadow-stick data and the Equation of Time to determine longitude

<https://www.abingdonsciencepartnership.org/wp-content/uploads/2020/04/A9-Longitude-from-a-Shadow-Stick-2.pdf>

Also - booklets and information:

<https://www.abingdonsciencepartnership.org/gcse-astronomy/>