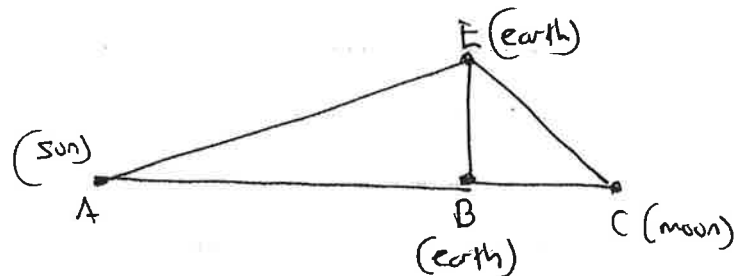


ASG vol 3 EX 13.1 (Descartes' method...)

How accurately would we need to measure angles between the moon & sun & earth to determine the speed of light from the observation of the moon's eclipses?



$$V_{\text{light}} = 3e8 \text{ m/s}$$

$$\overline{BC} = 3.8e8 \text{ m}$$

$$\overline{AB} = 1.5e11 \text{ m}$$

$$V_{\text{earth}} = 2\pi \overline{AB} / T_{\text{orbit}} = 3.0e4 \text{ m/s}$$

$$T_{\text{light}} = \text{time for light to travel from earth to moon \& back}$$

$$= 2\overline{BC} / V_{\text{light}} = 2.5 \text{ seconds}$$

$$\text{So } \overline{BE} = V_{\text{earth}} \times T_{\text{light}} = 7.5e4 \text{ m}$$

$$\angle BAE = \arctan\left(\frac{\overline{BE}}{\overline{AB}}\right) = 5e-7 \text{ radians}$$

or about 0.00003 degrees (very small)

The other angles are as follows:

$$\angle AEB = 89.99997^\circ$$

$$\angle BEC = 89.98869^\circ$$

$$\angle ECB = 0.0113^\circ$$

$$\angle BAE = 0.00003^\circ$$