

## The JETS Challenge

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### Challenge 44 – The Lunar Eclipse Challenge

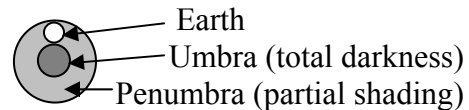
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**Problem:**

*In the year 2006, there is a lunar eclipse on Pi Day, March 14. This particular event is unusual since it is a total penumbral eclipse. According to Belgian eclipse expert Jean Meeus [1997] this is one of only five such events during the 21st century. The whole Moon will lie completely within the penumbral (partial) shadow from 23:18 UT (Universal Time) to 00:18 UT (Mar 15). The average distance between the earth and the moon is 384,403 kilometers and a complete orbit takes 29.53059 days.*

**During this 60 minutes of eclipse, how many kilometers will the moon travel in its orbit of the earth?**

Detail showing the earth passing through the moon's penumbra  
(viewed from the moon with the sun behind you)



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**Solution:**

During the 29.53 days of the lunar month and the average distance of 384,403 km, the moon travels a total of  $2 \pi R \text{ km} = (2)(3.14159)(384\,403) = 241527.3 \text{ km}$ .

The one hour of eclipse is  $1 \text{ hr} / (29.53059 \times 24 \text{ hr}) = 1 \text{ hr} / 708.73 \text{ hr} = 0.00140966$

$0.00140966 \times 241527.3 = 3,407.9 \text{ km}$