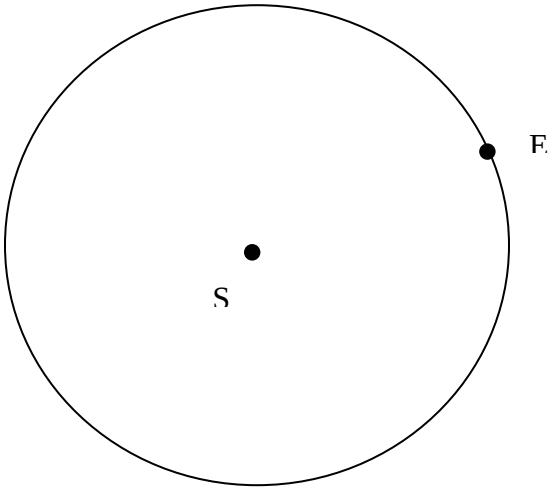
An Orbit Problem

The orbit O of the moon, as it moves around the earth, as the earth moves around the sun, is a curious path. We shall explore a somewhat simplified version of the actual orbital path by using the *simplifying* assumptions listed below.

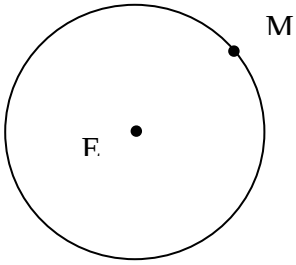
- The orbit of the earth around the sun and the orbit of the moon around the earth both lie in the same plane, and each orbit is circular.
- The moon orbits the earth every month, and a month is thirty days. The earth orbits the sun every year, and a year is twelve months.
- The distance from the center E of the earth to the center S of the sun is 93,000,000 miles, and the distance from the center of the earth E to the center M of the moon is 240,000 miles.

The figures below are clearly not drawn to scale!

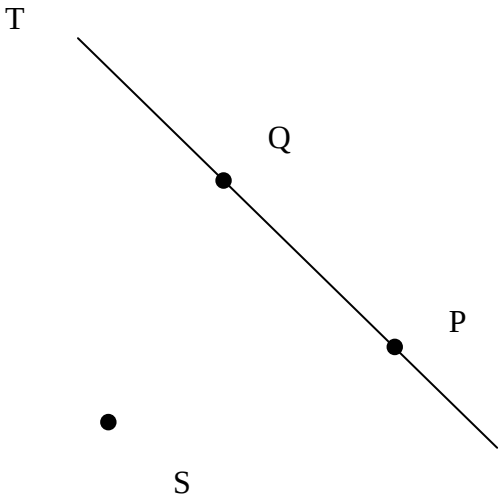
Sun – Earth System



Earth – Moon System



Suppose P denotes a point on the orbit O of the moon around the sun that is a maximum distance from the sun. As the moon continues along its orbit, there will be a *next* time at which the moon is at a maximum distance from the sun. Let Q denote the point on the orbit corresponding to the moon's position at this time. Finally, let N denote the point on the orbit of the moon around the sun that is *in-time* between orbit points P and Q, and is a minimum distance from the sun. Define T to be the line containing P and Q. The line T divides the plane containing the orbit of the moon into two half planes. The point S lies in one of these half planes. Where does the point N lie? That is, in which half plane is the point N?



Justify your answer!

Can you pose and address this problem with more realistic assumptions on the orbits?