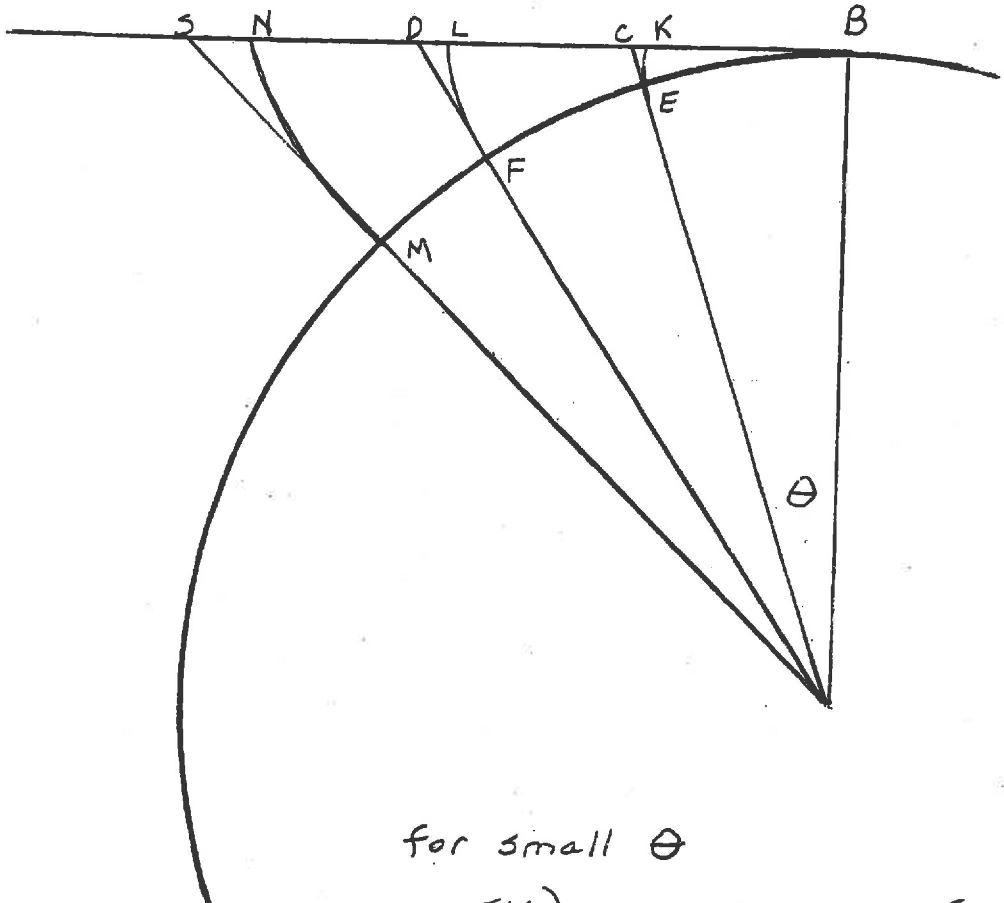


for small θ

$$\left.\begin{matrix} EK \\ FL \\ MS \end{matrix}\right\} \text{differ little from} \left\{\begin{matrix} EC \\ FD \\ MS \end{matrix}\right.$$

and

$$EC \propto \left(\frac{1}{\cos\theta} - 1\right) \Rightarrow \theta^2 \propto t^2$$

i.e.

$$EC \propto t^2$$

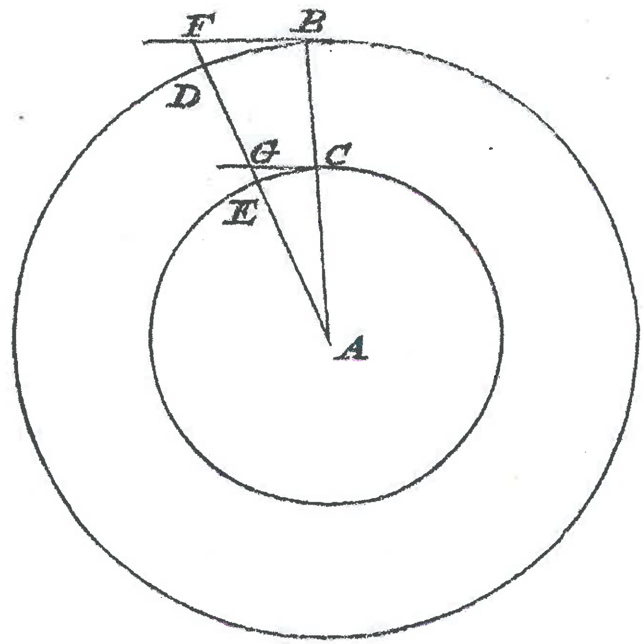
HUYGENS ON "CENTRIFUGAL FORCE"

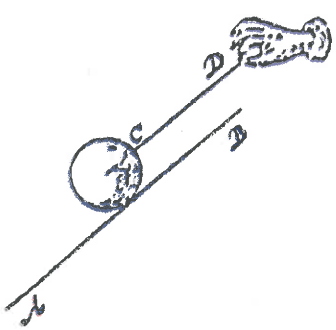
The ***tension*** in the string that retains a body in uniform circular motion varies as

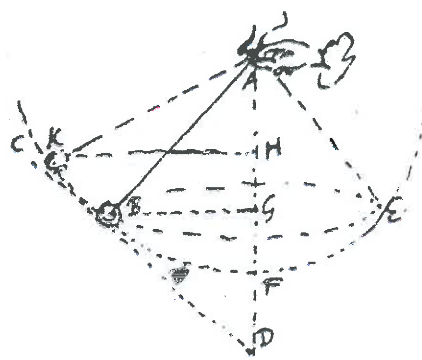
$$EG/\delta t^2 \propto (GC^2/AG)/\delta t^2$$

$$\propto v^2/r \propto r/P^2$$

times the ***weight*** of the body







Euclid's Elements

Book III

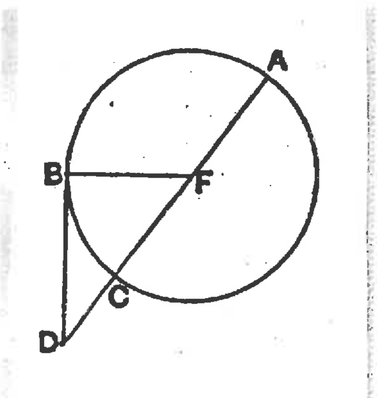
Proposition 36

If a point is taken outside a circle and two straight lines fall from it on the circle, and if one of them cuts the circle and the other touches it, then the rectangle contained by the whole of the straight line which cuts the circle and the straight line intercepted on it outside between the point and the convex circumference equals the square on the tangent.

Let a point *D* be taken outside the circle *ABC,* and from *D* let the two straight lines *DCA* and *DB* fall on the circle *ABC.* Let *DCA* cut the circle *ABC,* and let *BD* touch it.

I say that the rectangle *AD* by *DC* equals the square on *DB.*

Then *DCA* is either through the center or not through the center.



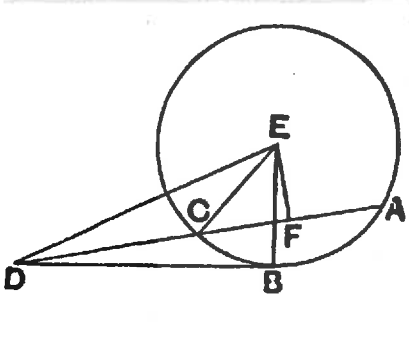
First let it be through the center, and let *F* be the center of the circle *ABC.* Join *FB.* Therefore the angle *FBD* is right. III.18

And, since *AC* has been bisected at *F,* and *CD* is added to it, the rectangle *AD* by *DC* plus the square on *FC* equals the square on *FD.* II.6

But *FC* equals *FB,* therefore the rectangle *AD* by *DC* plus the square on *FB* equals the square on *FD.*

And the sum of the squares on *FB* and *BD* equals the square on *FD,* therefore the rectangle *AD* by *DC* plus the square on *FB* equals the sum of the squares on *FB* and *BD.* I.47

Subtract the square on *FB* from each. Therefore the remaining rectangle *AD* by *DC* equals the square on the tangent *DB.*



Again, let *DCA* not be through the center of the circle *ABC.* Take the center *E,* and draw *EF* from *E* perpendicular to *AC.* Join *EB, EC,* and *ED.* III.1

Then the angle *EBD* is right. III.18

And, since a straight line *EF* through the center cuts a straight line *AC* not through the center at right angles, it also bisects it, therefore *AF* equals *FC.* III.3

Now, since the straight line *AC* has been bisected at the point *F,* and *CD* is added to it, the rectangle *AD* by *DC* plus the square on *FC* equals the square on *FD.* II.6

Add the square on *FE* to each. Therefore the rectangle *AD* by *DC* plus the sum of the squares on *CF* and *FE* equals the sum of the squares on *FD* and *FE.*

But the square on *EC* equals the sum of the squares on *CF* and *FE*, for the angle *EFC* is right, and the square on *ED* equals the sum of the squares on *DF* and *FE*, therefore the rectangle *AD* by *DC* plus the square on *EC* equals the square on *ED*. I.47

And *EC* equals *EB*, therefore the rectangle *AD* by *DC* plus the square on *EB* equals the square on *ED*.

But the sum of the squares on *EB* and *BD* equals the square on *ED*, for the angle *EBD* is right, therefore the rectangle *AD* by *DC* plus the square on *EB* equals the sum of the squares on *EB* and *BD*. I.47

Subtract the square on *EB* from each. Therefore the remaining rectangle *AD* by *DC* equals the square on *DB*.

Therefore *if a point is taken outside a circle and two straight lines fall from it on the circle, and if one of them cuts the circle and the other touches it, then the rectangle contained by the whole of the straight line which cuts the circle and the straight line intercepted on it outside between the point and the convex circumference equals the square on the tangent.*

Q.E.D.

Guide

This proposition is used in the next one.

Next proposition: III.37

Previous: III.35

Book III introduction

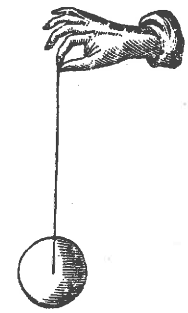
Select from Book III

Select book

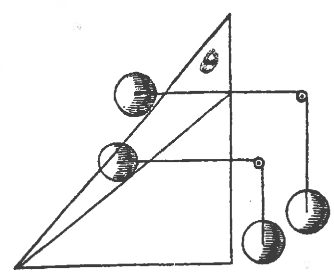
Select topic

Some Pertinent Principles from Statics

The tension in a vertically suspended string produced by a body hanging from it varies as the density and volume of the body and the strength of the tendency bodies at the location in question have to descend.



The tension in a string retaining two bodies in static equilibrium, one vertically and the other on an inclined plane, varies as the cosine of the angle of the plane θ and the tension in a vertically suspended string that would be produced were the body on the inclined plane hanging from it.



The tension in a string BK required to maintain a body in equilibrium at an angle θ varies as the tangent of that angle and the tension in string BH when that body is hanging vertically at its end.