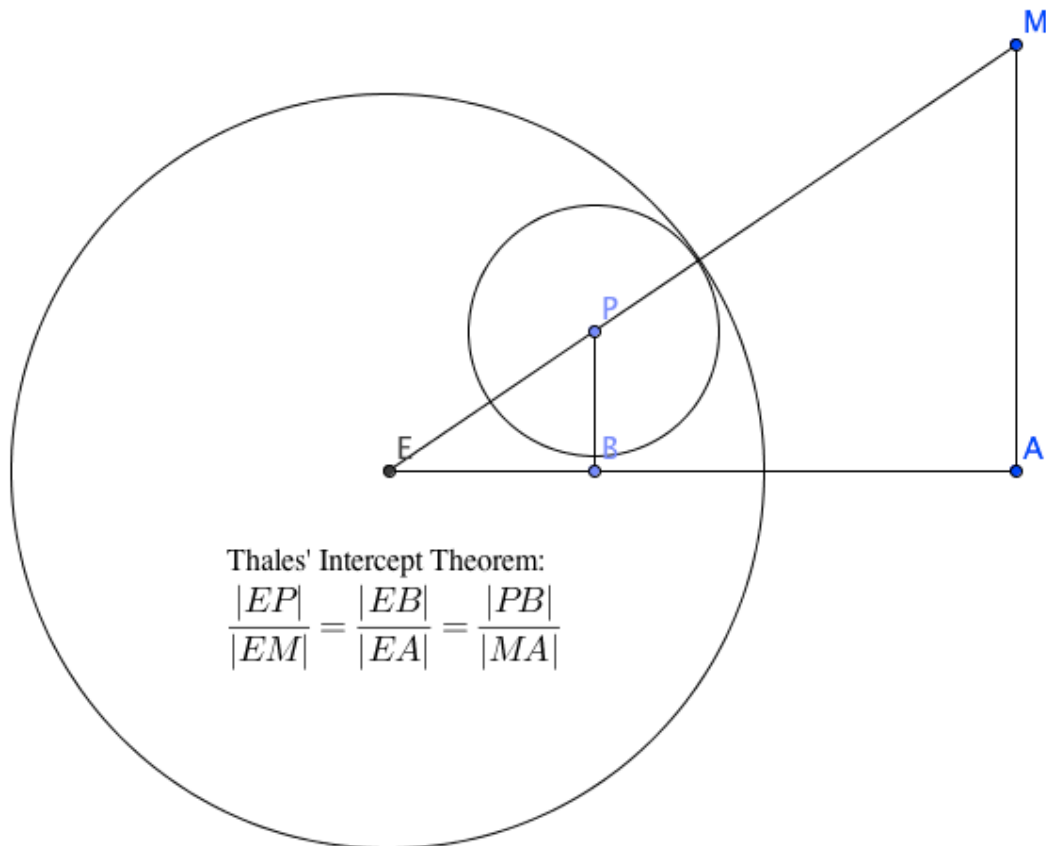


Ogly

Do The Math

This document explains how Ogly's pupils are able to track the mouse. The goal here is to move the center of each pupil as far as possible on the line between the center of the eye and the position of the mouse, without letting the pupil leave the eye. The following solution does not take into account the special case where the pupil is larger than the eye.

First, we need to understand what distance corresponds with "as far as possible". The following diagram makes this clear:



In this diagram, point E is the center of the eye, point P is the center of the pupil and point M is the position of the mouse. The distance EP is the maximum distance the center of the pupil can move away from the center of the eye. This distance is equal to the difference between the radius of the eye and the radius of the pupil.

The goal here is to find the offsets EB and PB needed to position the center of the pupil. Thales' Theorem gives us a way to find these offsets. Because E and M are known, so are distances EM, EA and MA. Because we want to move the pupil as far as possible, EP is equal to the difference between the radius of the eye and the radius of the pupil. With this in mind, we can easily extract EB as $(EP / EM) * EA$ and PB as $(EP / EM) * MA$. These offsets can be added to the center of the circle to find the center of the pupil.

Finally, in the special case where EM is smaller than the difference between the radius of the eye and the radius of the pupil, the point M simply becomes the center of the pupil.