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MTED 2690
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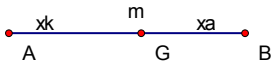
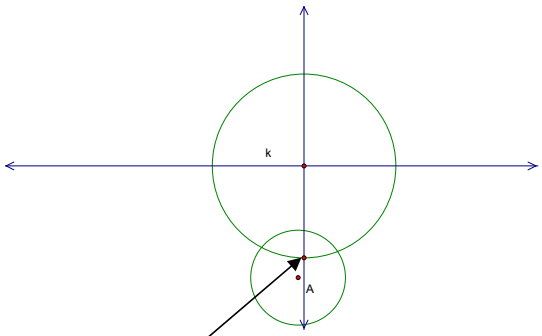
Explanation for Construction #5

Given: Point A, line k, and length m.
Construct the locus of points X such that m = Dist(X,A) + Dist(X,k)

- Since I am trying to construct the sum of the distances, I separate length m into segments xk and xa.

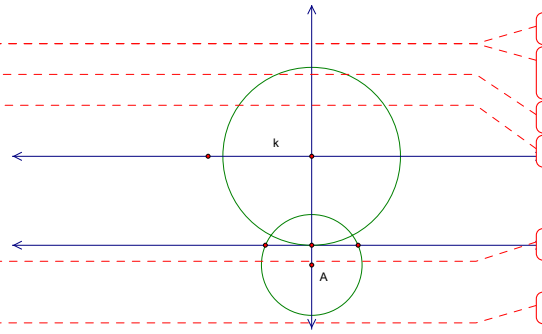


- I then construct a point on line k and form a perpendicular line from that point. I do this because I must measure the distance of a point *perpendicular* to the line and/or point.



- Since I am trying to construct the locus of points where m equals the sum, I must construct the distance of each segment (xa and xk) from the line k and point A. I can do this by constructing a circle with radius xk from line k (and on the intersection of k and the perpendicular line) and a circle with radius xa from point A.

- I then know that I am looking for a way to find the locus. I see that if I were to move the circle's center along line k, the point at perpendicular distance xk from the circle's center would form a line parallel to line k. I then construct this line to show all those distances.



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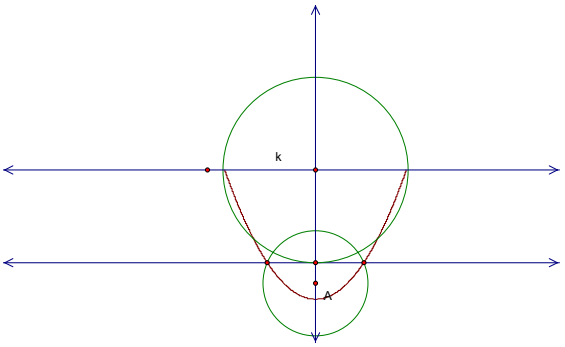
- Then I notice that the line composed of points at distance xk from k intersects the circle of radius xa centered at point A. Each point of intersection U will be

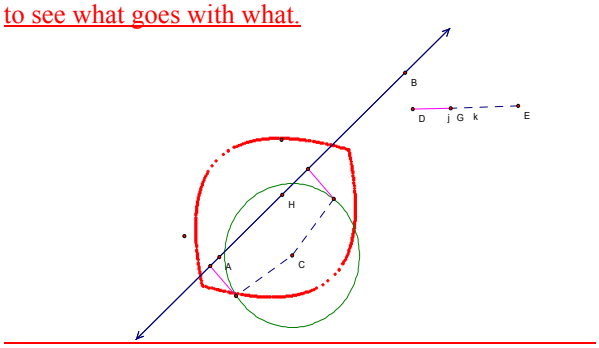
distance xk from line k and distance xa from point A, so it will satisfy the conditions that m=Dist(U,k)+Dist(U,A).

I know I can create intersections there because the distance of segment xa is the same since it is the radius of the circle.

- By creating those intersections, I have then created a way to find the locus of the points X. (How do you generate that locus?? By moving point G in your first diagram.) This holds to be true since the sum of both segments (xk and xa) equals length m. (see next diagram).



Notice that the points opposite (reflected) k also satisfy the condition. So, the locus actually looks like this. Notice how I color-coordinated the various segments and lengths so that it is easier to see what goes with what.



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Good job!

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