

9/19/2002

Explanations: 3,8

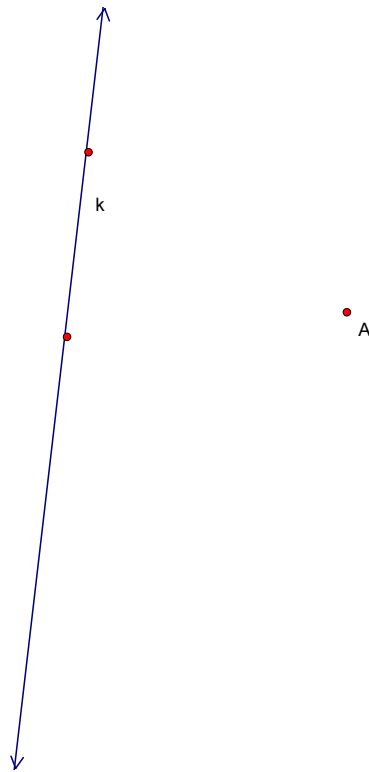
#3. Given point A and line k. Construct the locus of points X such that the $\text{Dist}(X,A)=\text{Dist}(X,k)$.

I admit that Dr. Thompson's demonstration of the construction of a parabola using Construction #3 of the first assignment helped me with this construction. However, I had made an error in that construction, which I have corrected for use in the current construction.

In the first assignment, the construction was the following: Given a line and a point not on the line construct a point equidistant from the given line and point. But, the new challenge with the current assignment was to construct the locus that would pass through this point constructed in the first assignment.

I would put it differently. I'd say that your new challenge is to find the locus of this point.

First, I constructed my givens for the current construction: Point A and line k:



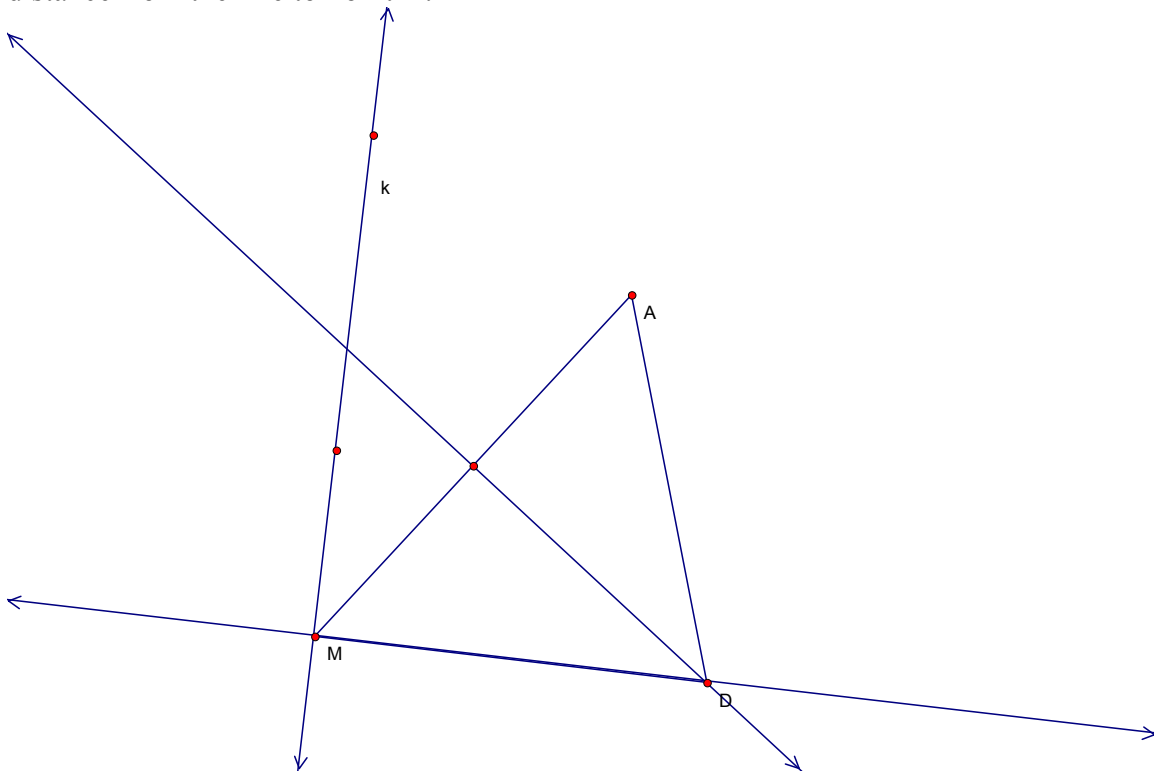
I then constructed a point M on line k so that I could construct a perpendicular line through this new point and line k. This perpendicular line would serve as a part of my eventual distance from a point (not yet formed) to line k. The perpendicular line would move if point M moved because it was dependent on point M. From this point M on line k, I also constructed a segment connecting it to point A and found the midpoint to the



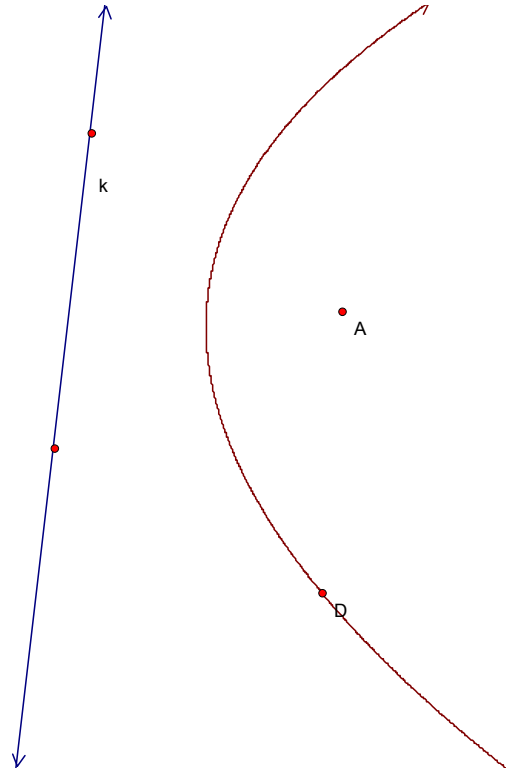
segment AM. Since the segment AM is dependent on point M and not on A, I could move the segment AM up and down line k while point A remained stationary.

Good.

The objective in finding the midpoint of segment AM was to use the point to construct a perpendicular bisector of the segment that would intersect the perpendicular line. Every point lying on a perpendicular bisector of a segment is equidistant from the endpoints of the segment. So, I knew the point of intersection, Point D, between the bisector and the perpendicular line I had formed would also be equidistant from the endpoints of the segment AM. (and therefore D would be equidistant from point A and line k). After I had constructed this point of intersection, I drew a segment between point D and point A. This segment represented the distance from Point A to Point D, which was equal to the distance from the line to Point D.



My final step was to choose two points to construct the locus of points such that the distance from any point on the locus to point A would be equal to the distance from any point on the locus to line k. I knew that the locus should pass through point D, since it is one point that is equidistant from the line k and point A. I chose D and point M because D is dependent on M, and a relationship of dependency is necessary to construct a locus:

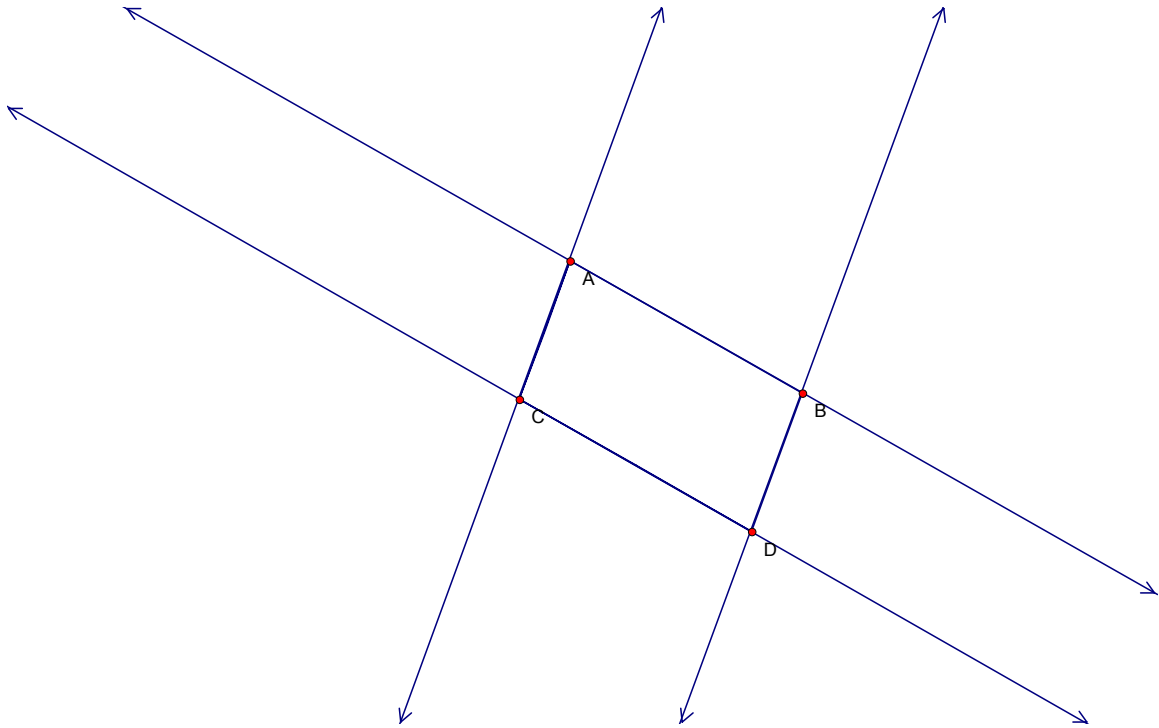


10/10. Good job.

#8. Given: Points A, B, C, D are midpoints of the sides of a quadrilateral. Construct the quadrilateral.

I think I misunderstood this problem on my first attempt. I understood it as the following: Given any four points that are the midpoints of the sides of a quadrilateral. Naturally, I did not understand yet that these points had to form a parallelogram. So, this statement could also be interpreted as the following: Given a parallelogram ABCD. Construct a quadrilateral **that has A, B, C, and D as midpoints.**

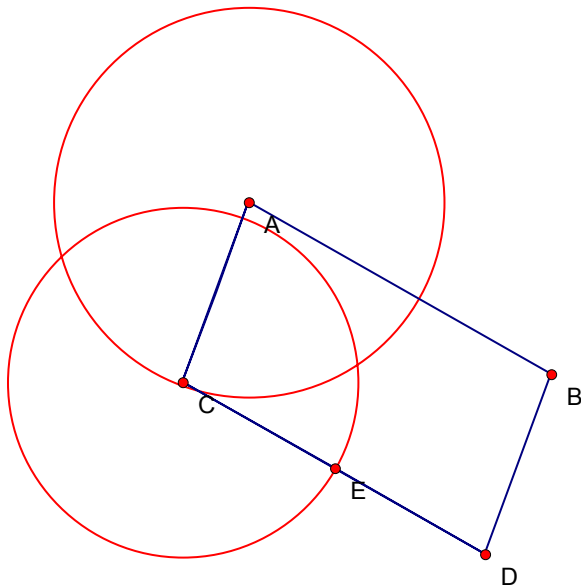
My first step was to construct a parallelogram. I constructed a line passing through A and B. Then I constructed line DB that intersected line AB at point B. Using point D and line AB, I constructed a parallel line to line AB. Finally, I constructed line AC parallel to line BD using point A and line BD. I created the intersection between AC and CD:



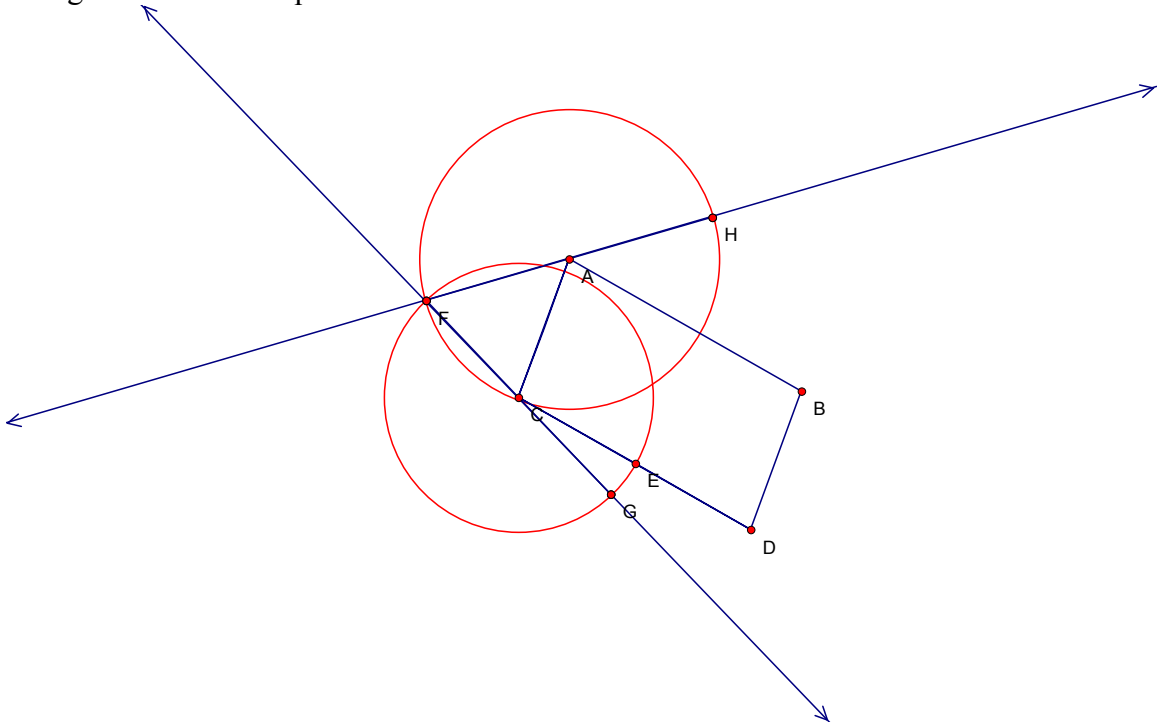
The creation of parallel lines in this manner ensured that $\text{Angle } D = \text{Angle } A$ and $\text{Angle } C = \text{Angle } B$ and that opposite segments would have equal measure. I created segments AC, CD, BD, and AB.

Starting with point A, I constructed a circle using Point A and radius AC. Why use AC as the radius? A is a midpoint of a to-be-constructed side, but the length of that side needn't necessarily be the length of AC.

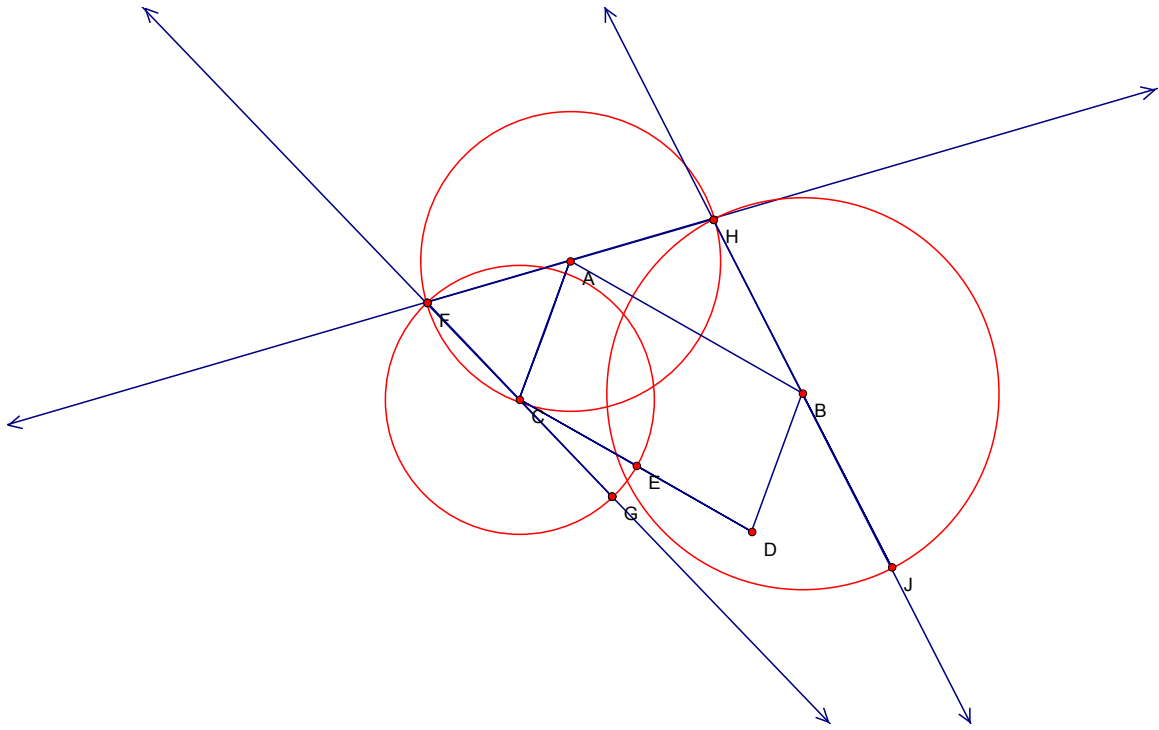
I then found the midpoint of segment CD, point E, and formed a circle using center C and segment CE.



I created the intersection F of the two circles and used this intersection to form a line through F and C. I created another intersection G where FC intersected the circle C close to E. This gave me one side of the quadrilateral, FG, with point C as a midpoint of FG. I also created a line AF that intersected circle A at points F and H. So, A was the midpoint of segment FH of the quadrilateral:



Next, I formed a line BH with segment BH. I used B and segment BH to construct a circle. The intersection of the circle B with the line BH was point J. HJ is the third segment of the quadrilateral:



Lastly, I created the segment DJ and used it and center D to form a circle, which intersected circle D at point G. This formed the last segment of my quadrilateral.

Interesting. You did get a quadrilateral *given these specific points*. But your construction will not generalize. If AC (the length of your first radius) is short enough, then you'll not have intersecting circles and therefore you will not create a quadrilateral having A, B, C, and D as midpoints.

Nevertheless, your explanation is a good one, because it allows the reader to *follow your reasoning* and thereby "quibble" with it.

Good try on the construction and good job on the explanation.

10/10

