Mathematics 2260H – Geometry I: Euclidean geometry
TRENT UNIVERSITY, Winter 2025

Assignment #7
Squaring a Rectangle
Due on Friday, 7 March.[*]

On Assignment #5 you were asked to construct a square equal in area to a rectangle that had 2 to 1 proportions, which made the task fairly easy. Here is a method that works for any rectangle:

> Suppose we are given rectangle $ABCD$, with the vertices listed in clockwise order from the top left. We can assume that $|AD| > |AB|$. (Why?) Exrend AD past D to E so that $|DE| = |AB|$. Let O be the midpoint of AE. Draw the circle with centre O and radius OE. Extend CD past D until it meets the circle at F. Then a square constructed on DF will have area equal to that of the rectangle $ABCD$.
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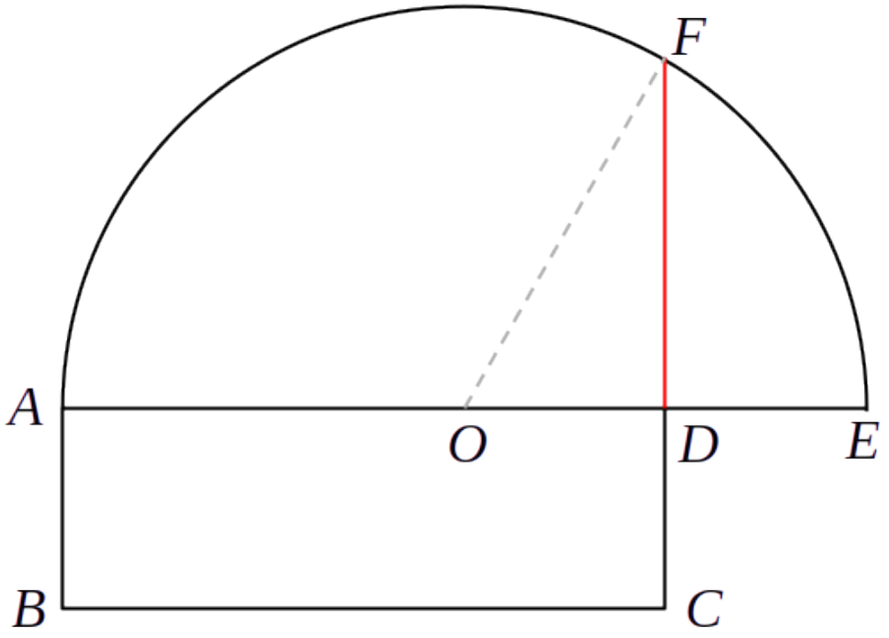
> The diagram below omits the final square to avoid clutter.



1. Show, using any method you like, that this method works. *[10]*

Hint: The easiest method known to your instructor starts with placing the diagram so that O is at the origin in the Cartesian plane and AE lies along the x-axis. Work out the y-coordinate of F ... For convenience in doing the algebra, let $|AB| = a$ and $|AD| = b$. If you want to do things the hard way, this is most of Proposition II-14 in Euclid's *Elements*.

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[*] Please submit your solutions, preferably as a single pdf, via Blackboard's Assignments module. If that fails, please submit them to the instructor on paper or via email to `sbilaniuk@trentu.ca` as soon as you can.