

Mth-4111 In the figure below, points E, F, G, and H are the midpoints of the sides on which they are located. Use analytical geometry to prove that segments EF and GH are parallel.

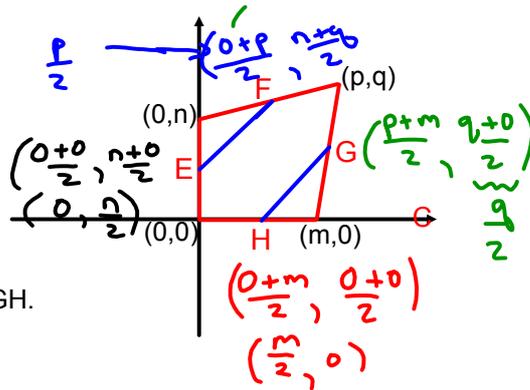
Hypothesis:

E and F are midpoints

G and H are midpoints

Conclusion to prove:

Segment EF is parallel to segment GH.



Statements	Justifications
① Coordinates of Midpoints : $E : (0, \frac{n}{2})$ $F : (\frac{p}{2}, \frac{n+q}{2})$ $G : (\frac{p+m}{2}, \frac{q}{2})$ $H : (\frac{m}{2}, 0)$	Midpoint Formula: $(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2})$
② $m_{EF} = \frac{\frac{n+q}{2} - \frac{n}{2}}{\frac{p}{2} - 0} = \frac{\frac{q}{2}}{\frac{p}{2}}$	Slope Formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$
$m_{EF} = \frac{q}{2} \div \frac{p}{2} = \frac{q}{p}$	
$m_{GH} = \frac{\frac{q}{2} - 0}{\frac{p+m}{2} - \frac{m}{2}}$	
$= \frac{\frac{q}{2}}{\frac{p}{2}}$	
$m_{GH} = \frac{q}{2} \div \frac{p}{2} = \frac{q}{p}$	
③ $\overline{EF} \parallel \overline{GH}$	Since the slopes are the same, the lines must be parallel.