Analysis task

Quadrilateral midpoints

When the midpoints of the four sides of a quadrilateral are joined in order, another quadrilateral is formed. Coordinate geometry can be used to investigate the properties of this quadrilateral.

a Using graph paper or GeoGebra, plot and label the points $A\ (-6, 7)$, $B\ (4, 5)$, $C\ (6, -1)$ and $D\ (-8, -5)$. Join the points in order to form the quadrilateral $ABCD$.

b Find the coordinates of the midpoint of each side of the quadrilateral. Label the midpoints E, F, G, H, with E as the midpoint of AB, F as the midpoint of BC, and so on.

c Make a conjecture about quadrilateral $EFGH$.

d Calculate the gradient of

- **i** EF
- **ii** FG
- **iii** GH
- **iv** HE.

e What do you notice about the gradients you have calculated in part **d**? Explain.

f State what this tells you about

- **i** EF and GH
- **ii** FG and HE.

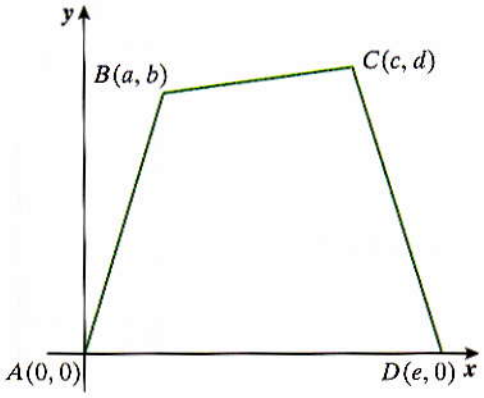
g What can you conclude about quadrilateral $EFGH$?

Challenge

Coordinate geometry can be used to prove the general case for any quadrilateral $ABCD$.

h Using the following diagram

- **i** repeat part **b**.
- **ii** repeat part **d**.



i Write a statement stating what you have proved.