SOLUTIONS

For the shape draw in the figure above:

a. Calculate the length of EF — 2 marks

b. Calculate the length of FG — 2 marks

c. Find the perimeter of the quadrilateral EFGH — 1 mark

d. Find the slope of both FG and EH — 2 marks

e. Prove that the quadrilateral EFGH is a rectangle. (Prove that one of its internal angles is a right angle) — 1 mark

f. Knowing the properties of that quadrilateral, find the point of intersection of its two diagonals.

EF

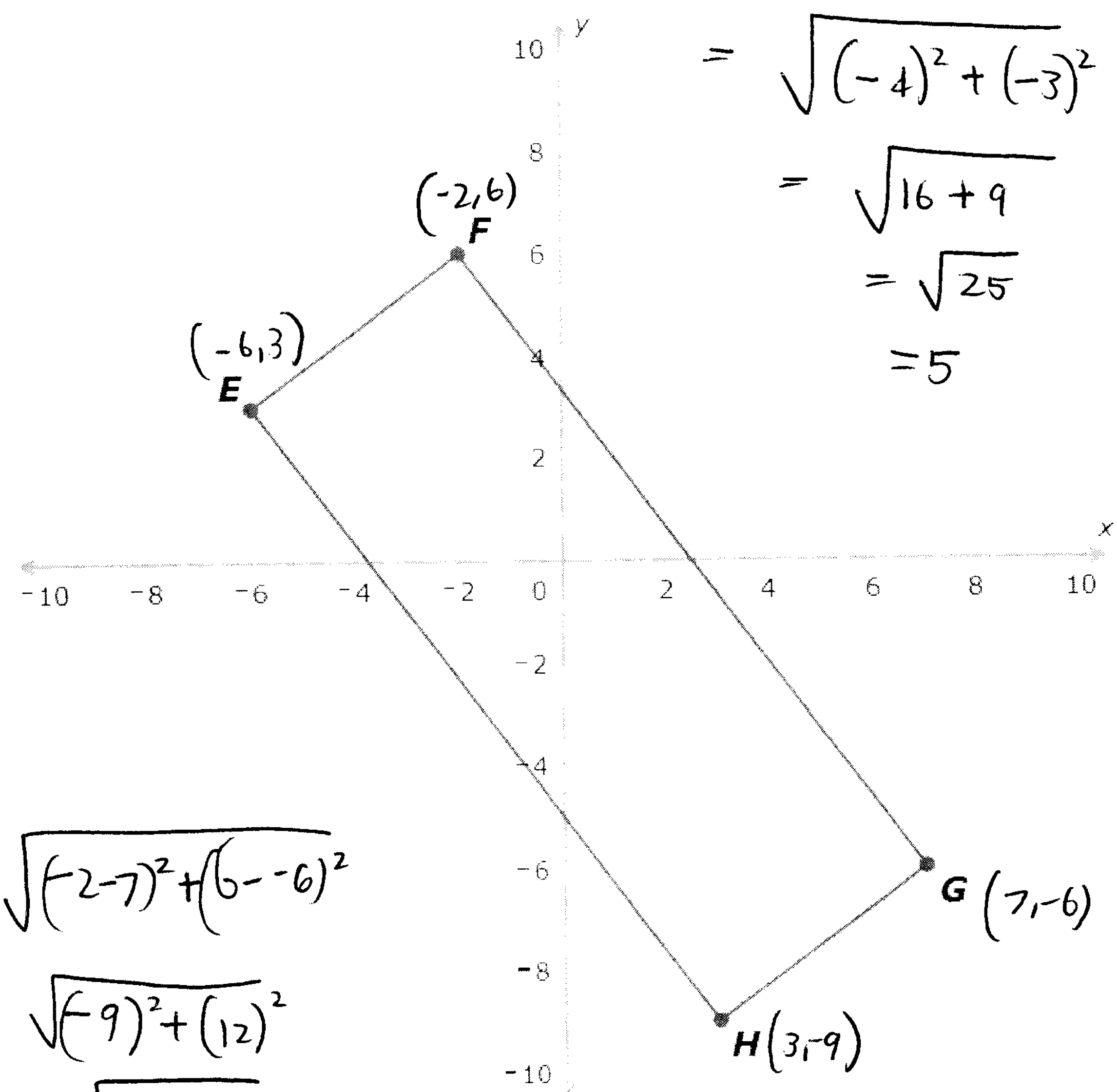
(a) $d = \sqrt{(-6 - -2)^2 + (3-6)^2}$

$= \sqrt{(-4)^2 + (-3)^2}$

$= \sqrt{16+9}$

$= \sqrt{25}$

$= 5$



(b)

FG

$d = \sqrt{(-2-7)^2 + (6 - -6)^2}$

$= \sqrt{(-9)^2 + (12)^2}$

$= \sqrt{81+144}$

$= \sqrt{225} = 15$

(c) EH:

$$d = \sqrt{(-6-3)^2+(3--9)^2}$$

$$= \sqrt{(-9)^2+(12)^2} = \sqrt{225}$$

$$= 15$$

HG:

$$\sqrt{(7-3)^2+(-6--9)^2} = \sqrt{4^2+3^2}$$

$$= 5$$

Perimeter $= 15 \times 2 + 5 \times 2$

$= 40$

(d)

For FG: $m = \dfrac{6--6}{-2-7} = \dfrac{-12}{9} = \dfrac{-4}{3}$

For EH: $m = \dfrac{3--9}{-6-3} = \dfrac{12}{-9} = -\dfrac{4}{3}$

(e)

Gradient of FG $= \dfrac{-4}{3}$

Gradient of GH $= \dfrac{-6--9}{7-3} = \dfrac{3}{4}$

Since gradient of GH is the negative reciprocal of gradient of FG,
GH and FG are perpendicular.

(f) Since the quadrilateral is a rectangle, its diagonals cross at the midpoint of each other.

Midpoint of EG $= \left(\frac{-6+7}{2}, \frac{3+-6}{2} \right)$

$= \left(\frac{1}{2}, \frac{-3}{2} \right)$

We can confirm this by finding the midpoint of FH:

$= \left(\frac{-2+3}{2}, \frac{6+-9}{2} \right)$

$= \left(\frac{1}{2}, \frac{-3}{2} \right)$

$\therefore$ The diagonals intersect at $\left(\frac{1}{2}, \frac{-3}{2} \right)$