2. The ellipse E has equation $\frac{x^2}{64} + \frac{y^2}{16} = 1$ and eccentricity e

(a) Determine the exact value of e

(2)

(b) Hence determine the shortest distance between a focus of E and its corresponding directrix, giving your answer as a simplified surd.

(2)

Given that

- the point P lies on E
- the line through P parallel to the x-axis meets the line with equation $x = 14$ at the point X
- the midpoint of PX is M

(c) show that, as P varies, the locus of M is a circle, giving a Cartesian equation for this circle.

(4)

(d) Hence write down the radius of the circle and the coordinates of its centre.

(2)

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Question 2 continued

(Total for Question 2 is 10 marks)