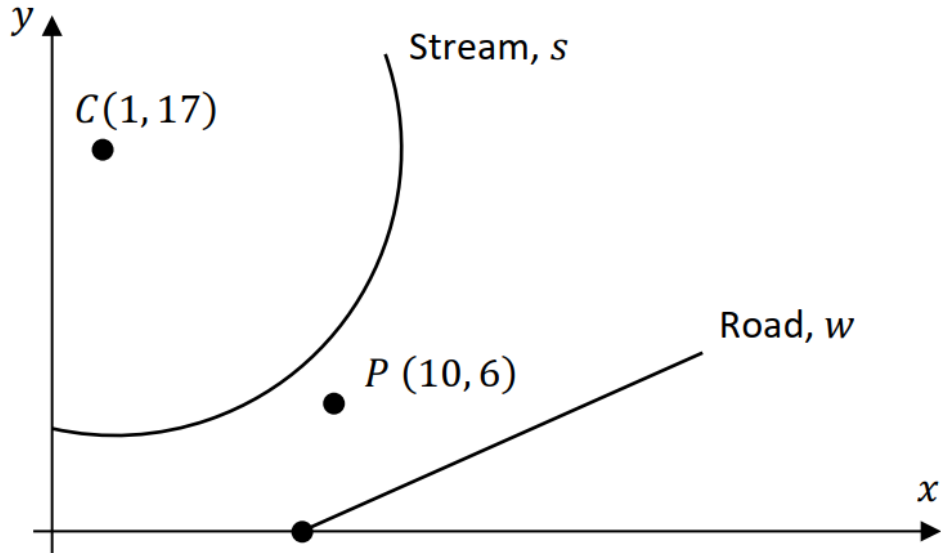


► 2024 LCHL Paper 1 – Question 9

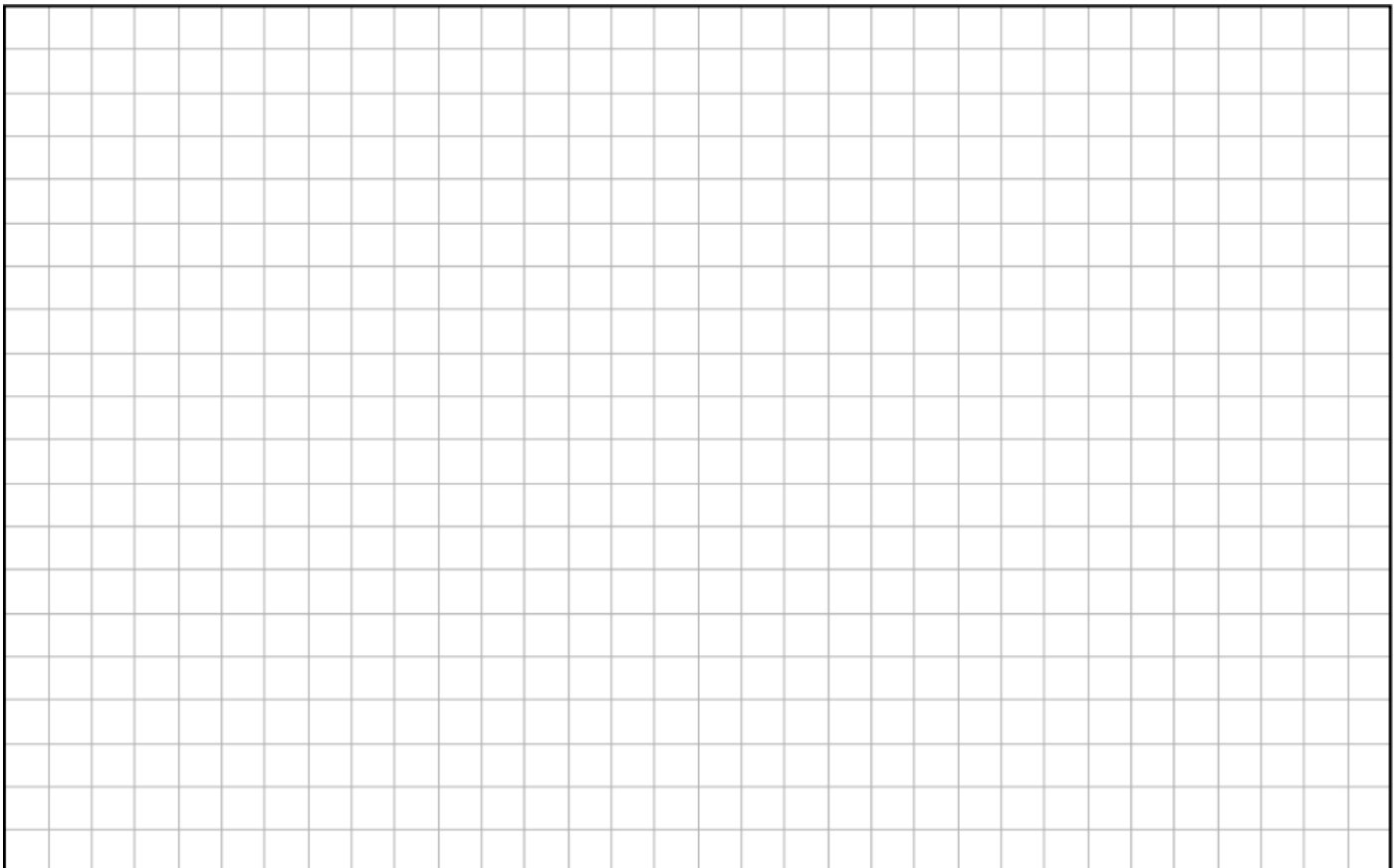
Ameena, Petro, and Fiadh are taking part in an adventure race.

The co-ordinate diagram below shows part of the course for this race.

Each unit on the diagram represents 100 metres.

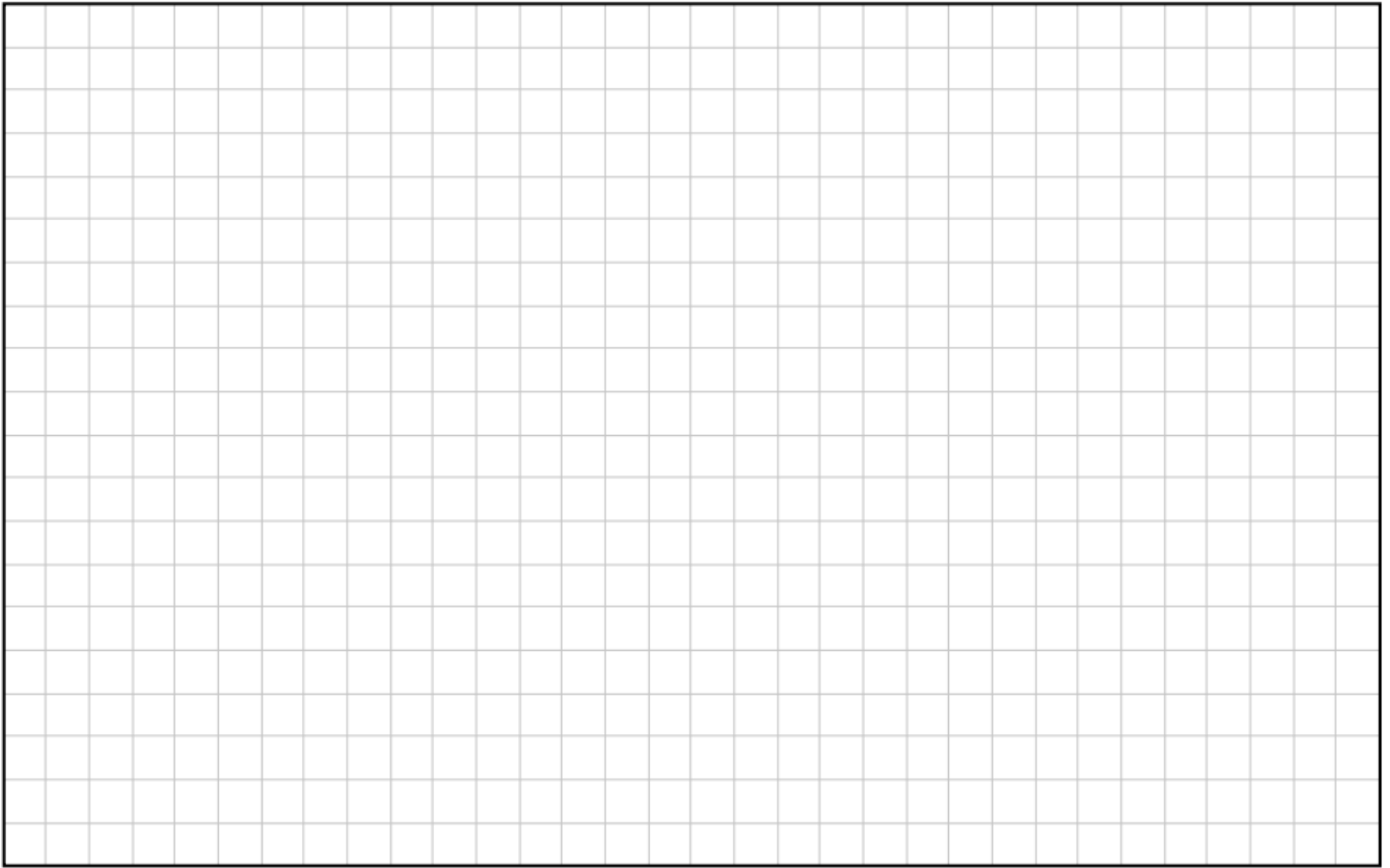


- (a) The arc in the diagram represents part of a stream.
The arc is part of a circle s with centre $C(1, 17)$ and radius 12.
- (i) Write down the equation of the circle s .



(ii) Ameena is at the point $(a, 8)$ on the stream (circle s), where $a \in \mathbb{R}$, $a > 0$.

Work out the value of a . Give your answer in surd form.

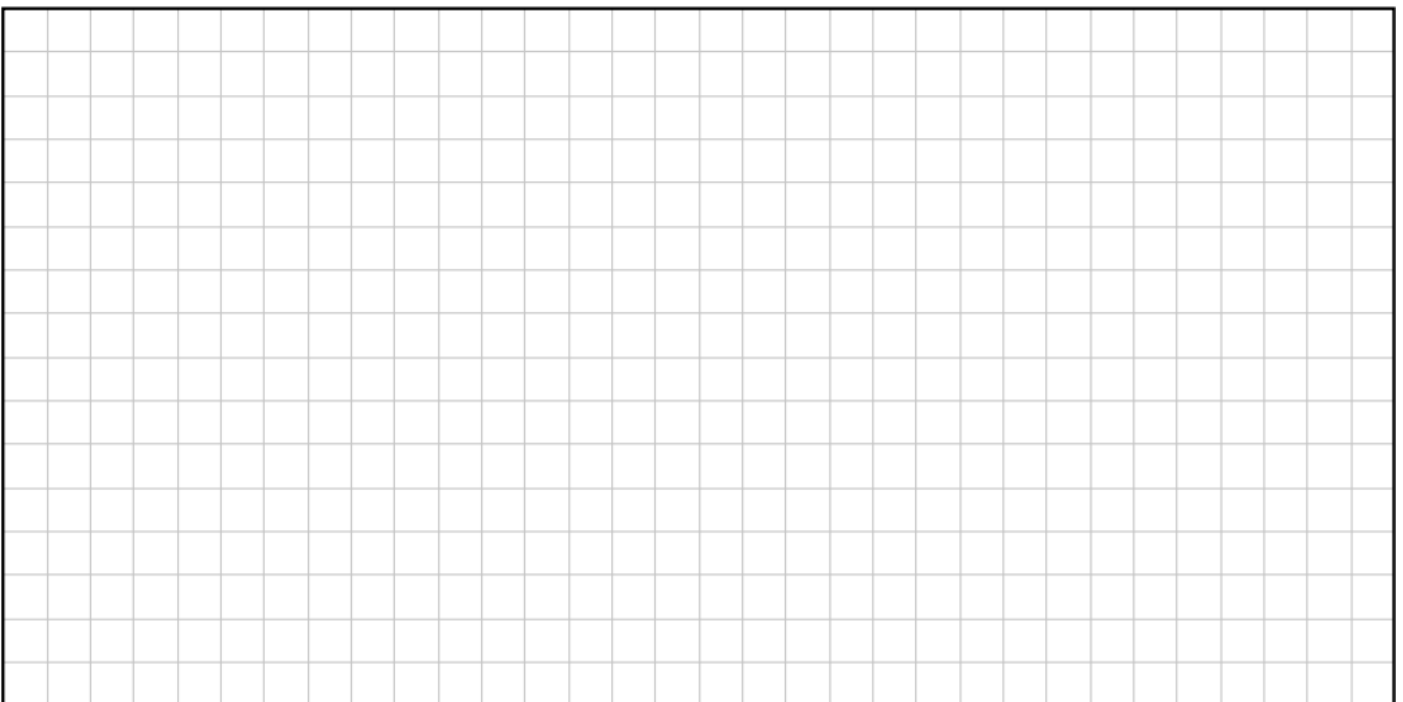


(iii) Petro is at the point $P(10, 6)$.

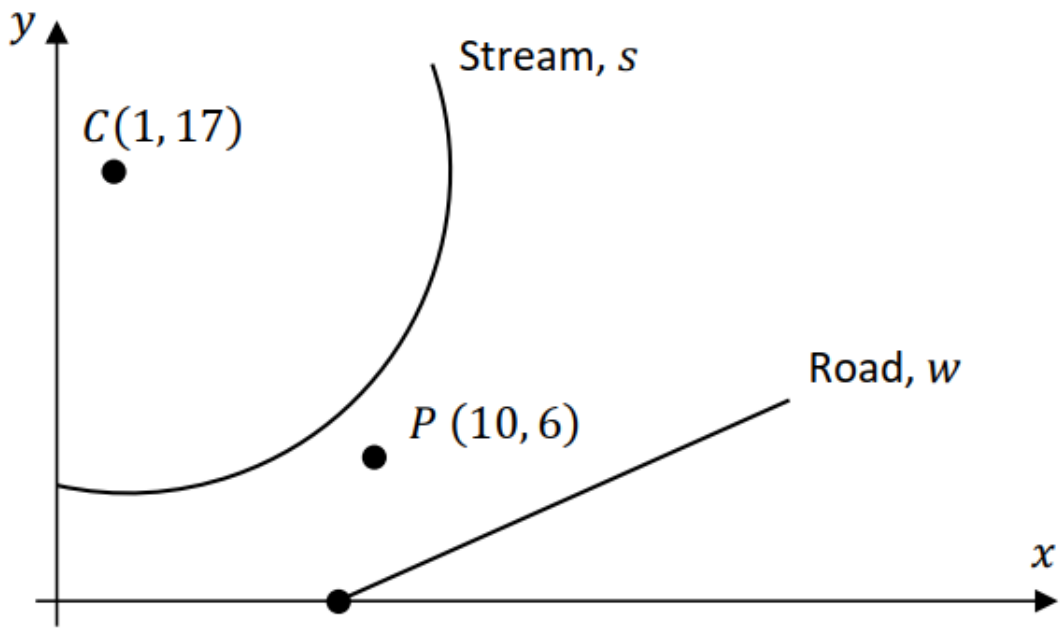
Work out the shortest distance from the point P to the stream (circle s).

Give your answer correct to the nearest metre.

Remember that each unit on the diagram represents 100 metres.



- (b) There is a straight path, l , that is not shown on the diagram.
 l is parallel to the y -axis, and is a **tangent** to the stream s in the first quadrant.

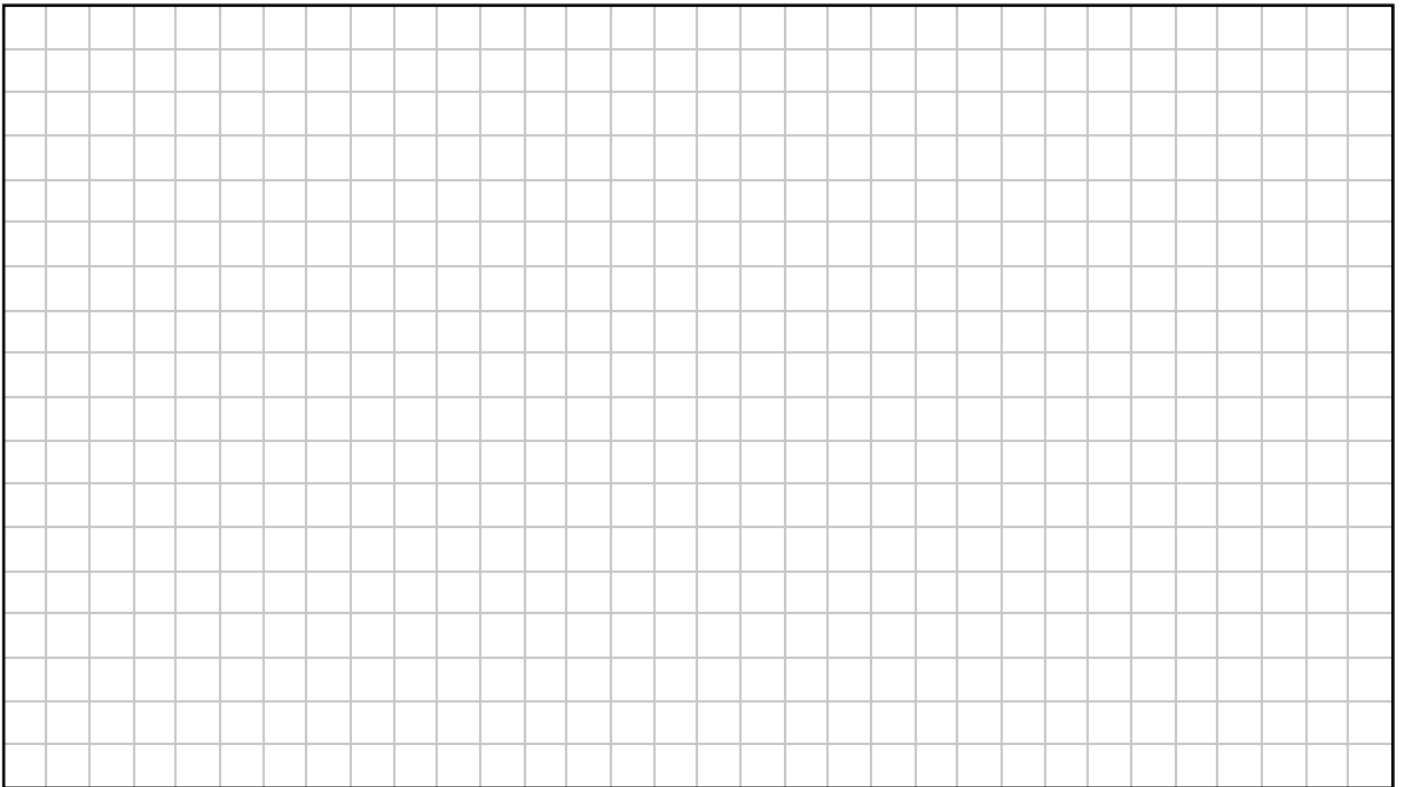


Write down the equation of this path l . Remember that the radius of s is 12.

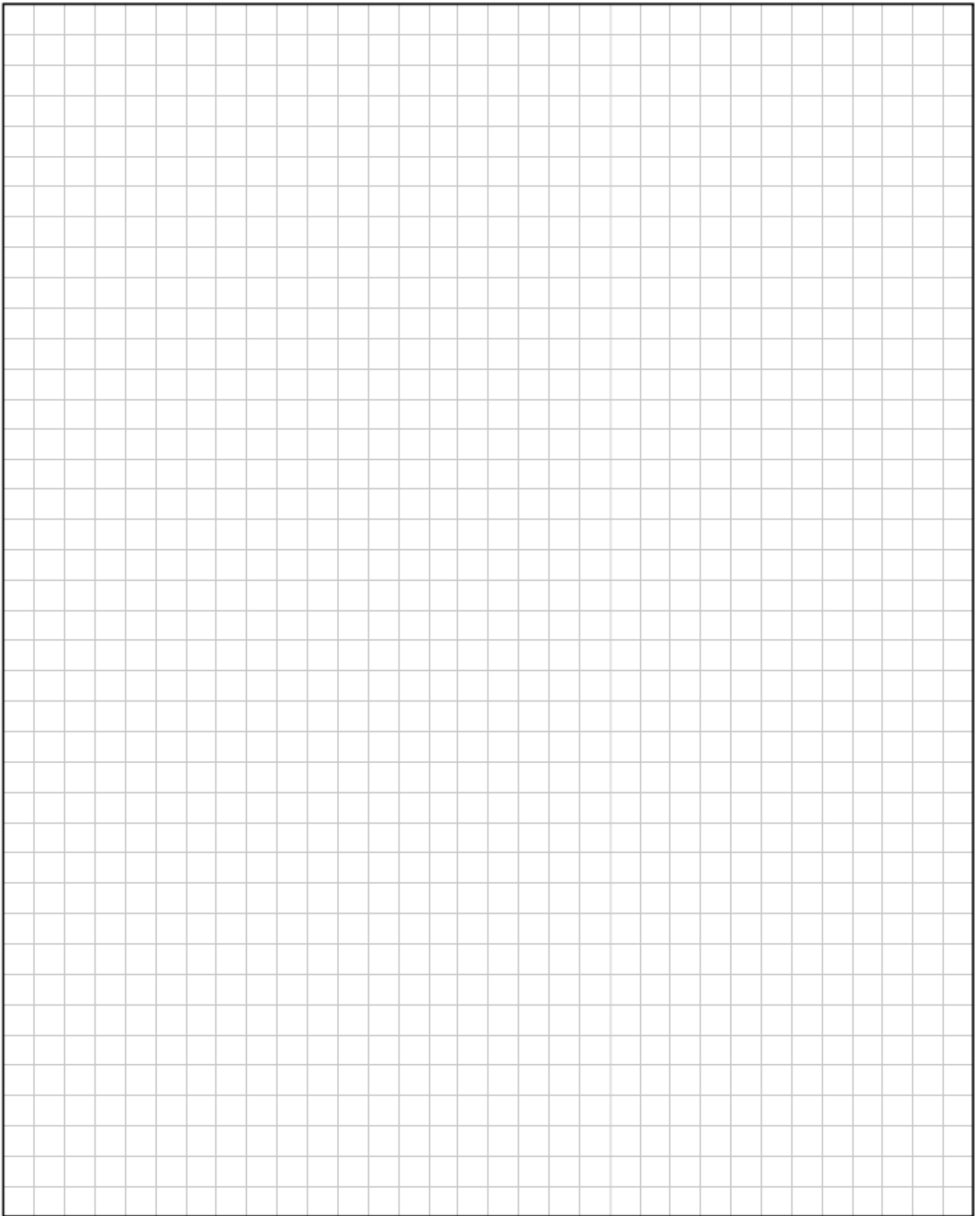
The line segment w represents a road, where w has the equation:

$$x - 3y = 9$$

for $0 \leq y \leq 8$.



- (c) Find the co-ordinates of the point on the road w that is closest to the point $P(10, 6)$.
It might be useful to find the equation of the line through P that is perpendicular to w .



(d) Fiadh is at the point $F(9, 0)$ on the road w .

She travels 1200 m along the road w away from the point F , in the first quadrant, and then stops.

Work out the co-ordinates of the point at which she stops. Give each value correct to 1 decimal place. Remember that each unit on the diagram represents 100 metres.

