

Let P and Q be the points with co-ordinates $(7, 1)$ and $(11, 2)$.

(i) The mirror image of the point P in the x -axis is the point R with co-ordinates $(7, -1)$. Mark the points P, Q and R on the grid provided opposite.

(ii) Consider paths from P to Q each of which consists of two straight line segments PX and XQ where X is a point on the x -axis. Find the length of the shortest such path, giving clear reasoning for your answer. (You may refer to the diagram to help your explanation, if you wish.)

(iii) Sketch in the line ℓ with equation $y = x$. Find the co-ordinates of S , the mirror image in the line ℓ of the point Q , and mark in the point S .

(iv) Consider paths from P to Q each of which consists of three straight line segments PY, YZ and ZQ , where Y is on the x -axis and Z is on the line ℓ . Find the shortest such path, giving clear reasoning for your answer.