

## STEP II, 2013, Q4 MS

### Question 4.

The equations of the line and circle are easily found and so the second point of intersection (and so the coordinates of M) can be easily found. The two parts of this question then involve regarding the coordinates of M as parametric equations.

In part (i)  $a$  is the parameter and is restricted so that the point that the line passes through is inside the circle. This gives a straight line between the points which result from the cases  $a = -1$  and  $a = 1$ . The length of this line can be determined easily from the coordinates of its endpoints.

In part (ii) it is again quite easy to eliminate the parameter from the pair of equations and the shapes of the loci should be easily recognised. In part (b) however, the restriction on the values of  $b$  need to be considered as the locus is not the whole shape that would be identified from the equation.



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