

**Problem 2.** For a shape  $S$  on the plane, let the width of  $S$  be the maximum value of the distance between two points on its boundary. Set

$$\pi(S) = \frac{\text{perimeter of } S}{\text{width of } S}.$$

(i) Find the range of all possible values  $\pi(S)$  for triangles  $S$  and the shape for which the maximum possible value is attained.

(ii) Find the range of all possible values  $\pi(S)$  for convex quadrilaterals  $S$  and the shape for which the maximum possible value is attained.