MASSACHUSETTS MATHEMATICS LEAGUE
FEBRUARY 2005
ROUND 5 GEOMETRY: CIRCLES

******* NO CALCULATORS ON THIS ROUND ******

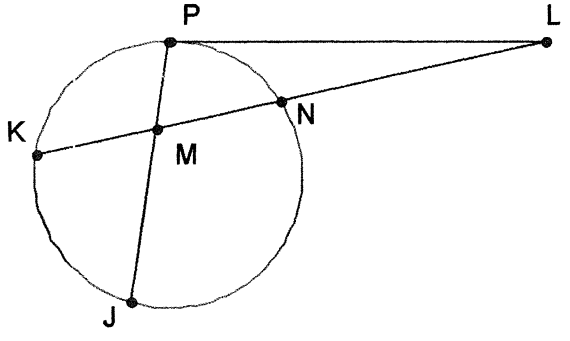
ANSWERS

A)_____

B)_____

C)_____

A) Given MJ=9, LN=13, M the midpoint of $\overline{KN}$, and PM=4 find the exact length of the tangent $\overline{PL}$



B) Circles Q, R, and S (as shown on the left below) are externally tangent and each has a radius of 3. Find the exact area of the total shaded region.

C) On the right below circles centered at A, C, and D are mutually tangent at E, B, and F. The largest circle has radius 12 and the smallest has radius 4. If $\overline{IB}$ is a tangent to the smaller circles find HF in simplified radical form.