Contest #2 **Bergen County Math League** **2018–2019**

Part I *Time Limit:* 12 minutes **No Calculators**

2–1. Find the length of a radius of a circle whose perimeter and area are numerically equal.

2–2. Find all values of k for which there is a solution (x, y) to the following system of equations.

$$\begin{cases} x + y = 2 \\ kx + y = 1 \\ x - y = k \end{cases}$$

Part II *Time Limit:* 12 minutes **No Calculators**

2–3. Point P has coordinates $(4, 1)$ and line l has equation $y = x$. A ray of light, emitted from P, travels to point Q on line l and is then reflected (as though by a mirror) to the point $R(3, 0)$. Find the coordinates of Q.

2–4. Factor $(ab - cd)^2 + (ad + bc)^2$ completely over the set of polynomials with integral coefficients.

Part III *Time Limit:* 12 minutes **No Calculators**

2–5. In an isosceles trapezoid, the lengths of the bases are 5 and 11, and the length of each diagonal is 10. Find the area of the trapezoid.

2–6. Arrange a, b, c, d in increasing order if $a = \sqrt{.16}, b = \sqrt[3]{.0639}, c = \sqrt[6]{0.0041}, d = (.2)^2$.

Answers

2–1. 2

2–2. -1 and 0

2–3. $(2, 2)$

2–4. $(a^2 + c^2)(b^2 + d^2)$

2–5. 48

2–6. d, b, a, c or $d < b < a < c$