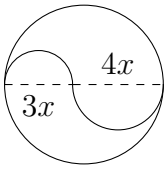
Contest #4 **Bergen County Math League** **2019–2020**

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



4–1. A circle's diameter is divided into segments with a ratio of 3 to 4, and semicircles are drawn on each segment, as shown. What is the ratio of the upper area to the lower area?

4–2. Find the four integers x for which $(x^2+x)^2 - 18(x^2+x) + 72 = 0$.

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

4–3. What is the smallest positive integer that cannot occur as the difference between two positive primes?

4–4. Find all real values of x for which $2^{2x} - 9(2^{x-1}) + 2 = 0$.

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

4–5. If $i = \sqrt{-1}$, find all values of x which satisfy $6x^2 + 7ix + 3 = 0$.

4–6. The bases $\overline{AB}$ and $\overline{CD}$ of isosceles trapezoid $ABCD$ are 12 inches apart, $AB = 10$ inches and $CD = 8$ inches. Point R is on the axis of symmetry of the trapezoid so that $m\angle CRB = 90°$. Find all possible distances (in inches) from R to $\overline{AB}$.

Answers

4–1. $\frac{4}{3}$

4–2. $-4, -3, 2, 3$ (all values required)

4–3. 7

4–4. $-1, 2$

4–5. $\frac{i}{3}, \frac{-3i}{2}$

4–6. $2, 10$