



MONTGOMERY COUNTY MATHEMATICS LEAGUE

Individual for Contest # 1

(No Calculators)

2014-2015

Time: 10 minutes

1. Line Segments \overline{AD} and \overline{CF} intersect at point O, and B is a point in the interior of acute $\angle AOC$. Segment \overline{BOE} is drawn, where E is a point in the interior of $\angle FOD$. If $m\angle AOF = 105$, and $m\angle EOD = 25$, find $m\angle BOD - m\angle AOC$.
 2. How many integers between 100 and 15,000 are themselves 11 times the square of an integer?
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Time: 10 minutes

3. The first term of a certain sequence is $1 + i$, where i is the the imaginary unit. For every term x of this sequence, the next term is always $ix + 1$. Find, in simplest form, the 27th term of this sequence.
 4. A train leaving a station heading due west travels at the rate of 99 km/hour. Concurrently, an ant starts from the engine, and heads (in a straight line) towards the caboose at 99 hours/km (relative to the train). In how many hours will the ant be 98 kilometers from where it started in the station? (The ant travels along the outside of the train)
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Time: 15 minutes

5. If $x = -2$, find the value of $-(-x - x^x)^{-x}$, expressing your answer as a rational number in reduced form.
6. The points of intersection of the graphs of $5x^2 - 3y^2 - 10x - 18y - 37 = 0$ and $3x^2 - 5y^2 - 6x - 30y - 27 = 0$ are the vertices of a convex quadrilateral. Find the area of this quadrilateral.