NEW ENGLAND MATHEMATICS LEAGUE

P.O. Box 6, Sharon, Massachusetts 02067-0006

All official participants must take this contest at the same time.

Contest Number 6 ***Any calculator without a QWERTY keyboard is allowed.*** Answers must be exact *or* have 4 (or more) significant digits, correctly rounded. **March 15, 2016**

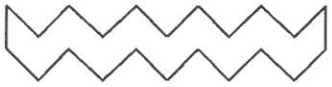
Name _____ **Teacher** _____ **Grade Level** ____ **Score** ____

Time Limit: 30 minutes FINAL CONTEST OF THE YEAR *Answer Column*

6-1. What is the least possible area of each of two rectangles which have equal areas and integral side-lengths, but are not congruent? 6-1.

6-2. What is the length of the hypotenuse of a right triangle, whose legs have lengths $\frac{\pi}{3}$ and $\frac{\pi}{4}$?  6-2.

6-3. For what value of k do $x^3+kx^2-3x+4 = 0$ and $x^3+kx^2-5x+8 = 0$ have a common solution? 6-3.

6-4. In polygon P at the right, every angle is 45°, 90°, or 135°. If the length of every segment is 1, what is the area of P?  6-4.

6-5. If $0° < x \leq 2016°$, how many angles x satisfy

$$\sin^2 2016° + \sin^2 x = 1?$$ 6-5.

6-6. Pat and Lee alternately toss two fair dice, Pat tossing first. The first to roll a 9 wins the money paid by both players. If Lee pays $400 to play, how many dollars should Pat pay to make this game fair? [In a *fair game*, each player's expected value is 0 (no net gain or loss).] 6-6.