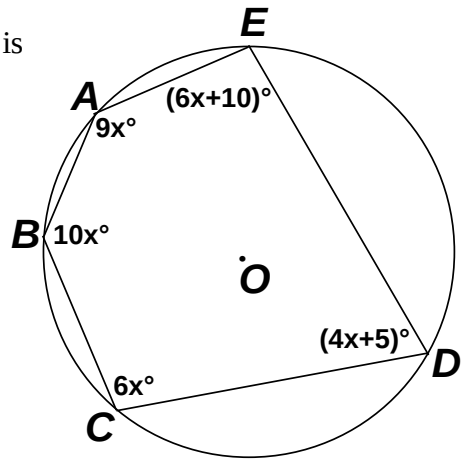
MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 5 - FEBRUARY 2016
ROUND 7 TEAM QUESTIONS

D) Two runners start at the same point on a quarter-mile track (440 yards) and run in opposite directions. The speed of the slower runner is *R* feet/sec.
If the faster runner were to run *k* feet/sec faster than the slower runner, the runners would pass each other for the first time in 1 minute and 50 seconds.
If the faster runner were to run *k* times as fast as the slower runner, the runners would pass each other for the first time in 1 minute and 28 seconds.
Compute the ordered pair (*f*, *s*), where *f* denotes the fastest possible speed (in feet/sec) and *s* denotes the slowest possible speed (in feet/sec) for the faster runner.

E) Pentagon *ABCDE* (with the indicated angle measures) is inscribed in circle *O*. Let $(a_1, a_2, a_3, a_4, a_5)$ denote the degree-measures of the 5 arcs subtended by pentagon *ABCDE*, where $a_1 \le a_2 \le a_3 \le a_4 \le a_5$
Compute $(a_1, a_2, a_3, a_4, a_5)$.



F) Let *T* be the series 2 + 5 + 9 + …, where each term, t_n, denotes the number of diagonals in a polygon with (*n* + 3) sides. [t_1 = 2 because a quadrilateral (a 4-gon) has 2 diagonals.]
Let *S* be the sequence of partial sums of *T*, namely 2, 7, 16, …
Determine the partial sum closest to 2016.