MASSACHUSETTS MATHEMATICS LEAGUE
NOVEMBER 2005
ROUND 7: TEAM QUESTIONS

ANSWERS

A)_____ **D)**_____**by**_____

B)_____ **E)**_____**m**

C)_____ **F)**_____

A) If $(1 + i)^{2006} = a + bi$ for real a and b, find the larger of a and b.

B) Given A, B, C, and D positive integer with A:B = 2:3 B:C = 5:8 and C:D = 20:27 express $\frac{AB}{BD + AD}$ as a simplified fraction.

C) A trapezoid has bases of 2 and 5 and legs of 1 and 3. Its area can be simplified to $\frac{a}{b}\sqrt{c}$ Find the sum $a + b + c$.

D) If a rectangle with side of length $3x - 4$ has an area of $12x^2 + 14x - 40$ and a perimeter of 194, find the dimensions of the rectangle.

E) A surveyor standing at a point on the ground so his eye is level with the bottom of a building measures the angle of elevation to the top of the building to be 60°. He backs up 30 meters and finds the angle of elevation has decreased by 15°. Find the exact height of the building in meters assuming the building is perpendicular to the ground.

F) ΔABC is isosceles with base $\overline{BC}$ The bisector of $\angle ABC$ intersects $\overline{AC}$ at D and intersects the bisector of the exterior angle from C at E. If ΔADB is also isosceles, find $m\angle BEC$.