MASSACHUSETTS MATHEMATICS LEAGUE
OCTOBER 2005
ROUND 7: TEAM QUESTIONS

ANSWERS

A)_____**cm** **D)** _____

B)_____ **E)**_____

C)_____ **F)**_____

A) A pile of four cue balls is formed such that each ball is tangent to the other three. If the radius of each ball is 2 cm. find the exact height of the pile.

B) Acute ΔABC has integral sides with BC = 27 and AB = 2AC. The altitude from A divides $\overline{BC}$ into two segments of integral length. Find the exact length of that altitude in simplified radical form.

C) Given $\frac{1}{x} + \frac{x}{y} + \frac{6}{z} = 14 - y$ and $y = 2x$ find z in terms of y assuming $xyz \neq 0$

D) A basic carpenter with an apprentice can frame a wall in 10 hours. A master carpenter with an apprentice can do it in 8 hours. A master carpenter working with a basic carpenter and no apprentices can do it in 6 hours. If a basic carpenter with apprentice began framing at 7 a.m. and the master carpenter joined them at 9 a.m. when did the three of them finish the job? Give answer to the nearest minute.

E) The minimum value of the following expression is $\frac{2}{3}$ and it occurs at $x = \frac{1}{2}$. Find all possible ordered pairs (a, b)

$$|ax + 2| + |bx - 1|$$

F) Keeping the normal order of operations we use $\ni$ and $\therefore$ to replace two of the usual arithmetic operations (addition, subtraction, multiplication, or division). If for any $a > 0$

$$a \ni (a \ni a) \ni (a \ni a) = a \ni 2 \therefore a \ni 2 = a$$

find $8 \therefore 6 \ni 2$