MASSACHUSETTS MATHEMATICS LEAGUE
MARCH 2004
ROUND 7: TEAM QUESTIONS: NON- CALCULATOR
ANSWERS

A)_____ **D)**_____

B)_____ **E)**_____

C)_____ **F)**_____

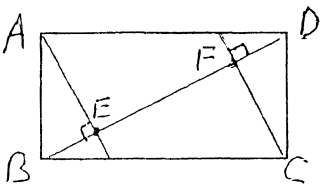
A) Solve for x: $\begin{vmatrix} x & 2 & 1 \\ 1 & x & 1 \\ -x & 3 & x \end{vmatrix} = \begin{vmatrix} 2x+1 & 1 \\ x & +7 & 2 \end{vmatrix}$

B) A box contains one dozen sugar cookies, eight chocolate chip cookies, and six oatmeal raisin cookies. If five cookies are chosen at random, what is the probability that two are chocolate chip, and three are sugar cookies?

C) Given $P(x) = x^3 + cx + d$, c and d are integers, and $P(3 + i) = 0$. Solve the equation $x^3 + cx + d = 3x^2 - 16x + 36$ for all possible roots.

D) A man drives due north at a constant rate for six hours, and then drives due east for five hours at rate that is four mph slower. He could have reached the same point travelling directly in seven hours and thirty minutes going at the original rate. What was his original rate?

E) Given rectangle ABCD, $\overline{AE}$ *and* $\overline{CF} \perp \overline{BD}$, BE = FD = 1, and EF = 2 Find the area of ABCD in simplified radical form.



F) Express in simplified radical form $\sqrt{9 + \sqrt{72}} + \sqrt{14 - 8\sqrt{3}}$