MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 5 - FEBRUARY 2014
ROUND 7 TEAM QUESTIONS

ANSWERS

A) _____ D) _____

B) _____ E) _____

C) _____ F) _____

A) Let $y = f(x)$ define a 5^{th} degree polynomial function. If $y = f(x)$ is an odd function and $f(1) = 0,\ f(2) = 42$ and $f\left(\frac{1}{2}\right) = \frac{3}{16}$, compute the zeros of $y = f(x)$.

B) Five boxes of apples (each with integral weights) are weighed two at a time. Every possible combination is weighed once, and the weights of each pair, in increasing order are:

110, 112, 113, 114, 115, 116, 117, 118, 120, 121 (111 and 119 are missing)

If (54, *a*, *b*, *c*, 62) denote the individual weights of the five boxes, where $54 < a < b < c < 62$. Determine how many distinct ordered triples (*a*, *b*, *c*) are possible.

C) Specify all real numbers for which the expression $Sin^{-1}\left(6x^2 - 5x\right)$ is defined.

D) One of my favorite hymns ("Holy, Holy, Holy") contains 16 measures. In $\frac{4}{4}$ time, each measure gets 4 beats and a quarter note is the unit, getting 1 beat. The hymn contains 5 different types of notes:

Quarter note (Q) – 1 beat

Half note (W) – 2 beats

Whole note (o) - 4 beats

Dotted quarter (Q.) - $1\frac{1}{2}$ beats

Eighth note (E) - $\frac{1}{2}$ beat

The hymn contains a total of 48 notes. The ratio of the number of quarter notes to the number of eighth notes is 7 : 1. There are as many dotted quarter notes as eighth notes. If the quarter notes account for as many beats as the half and whole notes combined, how many half notes are there?