MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 6 - MARCH 2014 SOLUTION KEY

Round 4

A) 2345_6 equals $2(6)^3 + 3(6)^2 + 4(6) + 5$ equals 569 and
1456_7 equals $1(7)^3 + 4(7)^2 + 5(7) + 6$ equals 580.
Thus, the difference is **<u>11</u>**.

B) $y = \dfrac{92-13x}{7} = 13 - x + \dfrac{1-6x}{7}$

x must be picked so that $\dfrac{1-6x}{7}$ produces an integer.

$x = -1$ produces a multiple of 7 in the numerator and other possible values of x can be found by adding or subtracting 7 (or any multiple of 7).
$x = -1 \Rightarrow y = 15$

The slope of the line is $\dfrac{-13}{7}$, so as x increases by 7, y decreases by 13 or equivalently as x decreases by 7, y increases by 13.

Thus, we have ordered pairs (–1, 15), (6, 2), (13, –11). P must be (6, 2).
Other points in quadrants 2 and 4 will be further from point P.
Therefore, $y_1 + y_2 + y_4 = 2 + 15 + (-11) = \underline{\mathbf{6}}$.

C) Let x and y denote the weights of the 2 contestants who initially dropped out.

$\dfrac{4500-(x+y)}{10} = 385 \Rightarrow x + y = 650 \Rightarrow \text{Ave} = \dfrac{x+y}{2} = 325$ Then:

$L = \dfrac{3850-10W}{10} = 0.4(325) \Rightarrow L = 385 - W = 130 \Rightarrow W = \underline{\mathbf{255}}$