

I U P U I
MATH CLUB TEASER #19

April 3, 2009
(due April 10, 2009)

SOLUTION

Use S, A, B, G to denote the bets on Seabiscuit, Abercrombie, Black Gold, and Greek Hero. Also, use F to denote the bet on each of the five horses in the field. The total bet is

$$B = S + A + B + G + 5F.$$

If Seabiscuit wins, the Professor gets back the bet S , plus 3 times that amount; i.e., the bookie pays a total of $4S$. According to the Professor, this amount represents the total bet B plus an extra \$200. In short, $4S = B + 200$. Similarly, for any of the other horses:

$$4S = 5A = 8B = 10G = 40F = B + 200.$$

Substitute these values in the first equation to find that

$$B = \frac{B+200}{4} + \frac{B+200}{5} + \frac{B+200}{8} + \frac{B+200}{10} + 5\frac{B+200}{40},$$

so
$$B = \left(\frac{1}{4} + \frac{1}{5} + \frac{1}{8} + \frac{1}{10} + \frac{5}{40}\right) (B + 200) = \frac{4}{5}(B + 200).$$

This shows that the total bet is $B = \$800$. The individual bets can be computed now from the second equation:

$$S = \$250, A = \$200, B = \$125, G = \$100, F = \$25.$$

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An alternative method to find this answer is to solve the linear system

$$\begin{pmatrix} 4 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ -1 & 5 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \\ -1 & -1 & 8 & -1 & -1 & -1 & -1 & -1 & -1 \\ -1 & -1 & -1 & 10 & -1 & -1 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & 40 & -1 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & -1 & 40 & -1 & -1 & -1 \\ -1 & -1 & -1 & -1 & -1 & -1 & 40 & -1 & -1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & 40 & -1 \\ -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & 40 \end{pmatrix} = \begin{pmatrix} 200 \\ 200 \\ 200 \\ 200 \\ 200 \\ 200 \\ 200 \\ 200 \\ 200 \end{pmatrix}.$$

SOLVED BY:

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