MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 6 – MARCH 2015 SOLUTION KEY

Round 2

A) $-2^4+(-8)^2=-(2^4)+(-8)^2=-16+64=48=2^4\cdot 3\Rightarrow k=\underline{\mathbf{4}}$

REMINDER (if you thought -2^4 was 16):
Consider that $-2^4=0-2^4$ and PEMDAS requires exponentiation be done before subtraction. There are no parentheses!

B) $\left(\sqrt{5}-\sqrt{2}\right)^4=\left(\left(\sqrt{5}-\sqrt{2}\right)^2\right)^2=\left(7-2\sqrt{10}\right)^2=89-28\sqrt{10}=A-B\sqrt{10}\Rightarrow(A,B)=(89,28)$

Thus, $(A-B)^2=61^2=(60+1)^2=3600+120+1=\underline{\mathbf{3721}}$.

C) $(x+y)^2=225(x-y)^{-2}\Rightarrow(x+y)^2(x-y)^2=225\Rightarrow\left(x^2-y^2\right)^2=225\Rightarrow x^2-y^2=\pm 15$

Since $x<y<0$, we need consider only $x^2-y^2=+15$
Also, for $x<y<0$, we have $x+y<x-y$.

$$\Rightarrow\begin{cases}x+y=-15\\x-y=-1\end{cases}\text{ or }\begin{cases}x+y=-5\\x-y=-3\end{cases}$$

Solving, the first set of equations gives us $\underline{(\mathbf{-8,-7})}$; the second $\underline{(\mathbf{-4,-1})}$.