**Bergen County Mathematics League**

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**Brief Contest Solutions #5**

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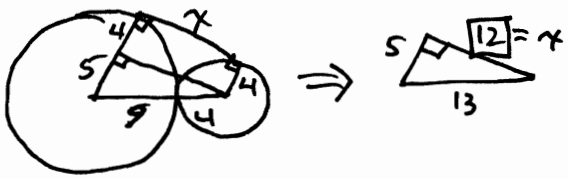
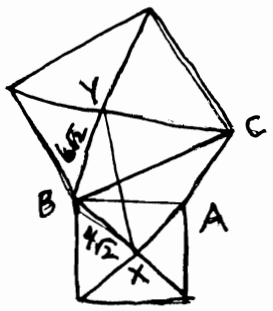
5-1) Since $|\sin x| \geq \sin^2 x$ and $|\cos x| \geq \cos^2 x$ and $\sin^2 x + \cos^2 x = 1$, we must have equality in the two inequalities, so $x = \boxed{0, \frac{\pi}{2}}$.

5-2) The medians of a $\Delta$ partition the $\Delta$ into 6 $\Delta$s of equal area. As shown at the left, the shaded region's area is $\frac{1}{6}(900) = \boxed{150}$.

5-3) By definition, $10^{\log_{10} x} = x$, $x > 0$. Therefore, $x + y = 50$ and $x - y = 48$ and $(x, y) = \boxed{(49, 1)}$.

5-4) 


5-5) $\sqrt{(a+b)(a+c)(b+a)(b+c)(c+a)(c+b)} = \boxed{(a+b)(a+c)(b+c)}$.

5-6) 


$m\angle YBX = 45 + 30 + 45 = 120$

Law of Cosines:

$XY^2 = 7^2 + 3^2 - 2(4)(3)\left(-\frac{1}{2}\right) = \boxed{52}$.