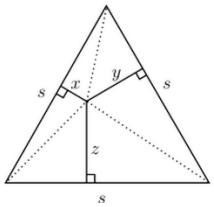
Math Club Worksheet: COMC Preparation Assignment #1 2015

Warm Up#1) There are eight balls in two urns. We give you two similar urns, four white balls, and four black balls. You must separate the balls amongst the two urns (not necessarily the same number in each urn), after which both urns will be made indistinguishable. How should the balls be distributed to maximize the chances that, if you draw a ball randomly from a randomly chosen urn, you will obtain a white ball? (COMC 2015)

Warm Up #2) Find two factors of $2^{48}-1$ between 60 and 70(COMC 2015)

Warm up #3) An arbitrary point is selected inside an equilateral triangle. From this point perpendiculars are dropped to each side of the triangle. Show that the sum of the lengths of these perpendiculars is equal to the length of the altitude of the triangle: (COMC 2015)



Question #4: Proofs) Given that "*abcdef*" is a six digit number where each letter represents a digit between 0 to 9. Prove that if $a+b+c+d+e+f$ is divisible by 3, then the number "*abcdef*" is also divisible by 3. {Basically, prove the divisibility rule for "3"}

Let *"a", "b",* and *"c"* be given nonzero real numbers. Find "*x*", "*y*" and "*z*" if the following equation is true:

$$\frac{ay+bx}{xy}=\frac{bz+cy}{yz}=\frac{cx+az}{zx}=\frac{4a^2+4b^2+4c^2}{x^2+y^2+z^2}$$

(COMC 2015)

A student mistakenly thinks that the equation below is correct: $\sqrt{a^2+b^2}=\sqrt{a^2}+\sqrt{b^2}$

Find as many ordered pairs of integers (a,b) such that $-10 \le a \le 10$ and $-10 \le b \le 10$, and that satisfies the equation: $\sqrt{a^2+b^2}=\sqrt{a^2}+\sqrt{b^2}$: Brilliant.org