

MATHEMATICS ENRICHMENT CLUB.

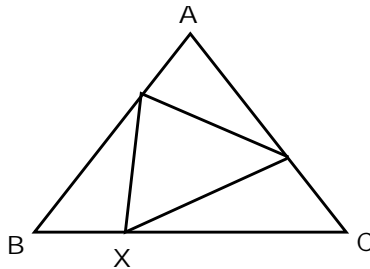
Senior Questions

1. Consider the quadratic equation

$$f(x) = x^2 - 2(c+1)x + c - 3;$$

where c is some real number. Let $\alpha, \beta > 0$, and suppose $\alpha + \frac{1}{\beta}$ and $2\alpha - \frac{1}{\beta}$ are the roots of $f(x)$. Find all possible values for c

2. Let $\triangle ABC$ be a triangle and $X; Y; Z$ points on the sides $BC; CA; AB$ respectively. Suppose $BX = XC; CY = YA; AZ = ZB$. Show that
- The area of $\triangle XYZ$ is not less than one quarter of the area of $\triangle ABC$.
 - One of the corner triangles $\triangle AZY; \triangle BXZ; \triangle CYZ$ has area not greater than the area of $\triangle XYZ$.



3. Given that a, b and c are positive integers, find the conditions for which the equation $\frac{p}{a} + \frac{p}{b} = \frac{p}{c}$ has a solution.
4. (bonus) Infinitely many physicists walk into a pub. The first physicist orders a beer, the second orders half a beer, the third a quarter, the fourth an $\frac{1}{8}$ and so on. The bartender happens to be a math student, what would the bartender tell the physicists?