



PUTNAM EXAM SEMINAR  
FALL 2013

QUIZ 3  
SEPTEMBER 25

**Exercise 1.** Six points are in general position in space (no three in a line, no four in a plane). The fifteen line segments joining them in pairs are drawn and each one is colored either red or blue. Prove that some triangle formed by these segments has all its sides the same color.

**Exercise 2.** Let  $M = \{1, 2, 3, \dots, 2048\}$  and let  $X \subseteq M$  such that  $|X| = 15$ . Show that there are two disjoint subsets of  $X$  whose sum of elements is the same. That is, show that we can find  $A, B \subseteq X$  with  $A \cap B = \emptyset$  and  $\sum_{a \in A} a = \sum_{b \in B} b$ .

**Exercise 3.** Given 10 points inside a circle of diameter 5, prove that there is a pair of them that are (strictly) within 2 units of each other.