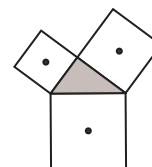


## Problems, October 2008

**Problem 1.** Solve for  $x$ :  $\frac{x-a}{b} + \frac{x-b}{a} = \frac{b}{x-a} + \frac{a}{x-b}$ .

**Problem 2.** Every point on the  $x$ -axis is coloured black or white. Show that there are two distinct points  $X, Y$  such that  $X, Y$ , and the point halfway between  $X$  and  $Y$  all have the same colour.

**Problem 3.** Outward facing squares are erected on the sides of a right-angled triangle whose legs have length  $a$  and  $b$ . What is the area of the triangle whose vertices are the midpoints of these squares?



**Problem 4.** Find all integers  $n$  such that  $n + 16$  is a perfect square and no prime greater than 3 divides  $n$ . (A correct list is not sufficient: one needs to show that there are no others.)