

Turn in your solution to at least two of the problems. **Explain your solution in full sentences. Give detailed reasonings.** Include diagrams and figures if appropriate.

**Problem 1.** A cube of butter is covered by black pepper on the surface. We cut the cube into two pieces with a knife so that a yellow plane polygon now becomes visible. What kind of regular polygons can we make this way?

**Problem 2.** Let  $a_1 \geq a_2 \geq a_3 > 0$  and  $b_1 \geq b_2 \geq b_3 > 0$ . Show that  $a_1b_1 + a_2b_2 + a_3b_3$  is the maximum of the set of all similar expressions.

**Problem 3.** Solve the inequality

$$\frac{|4x - 1|}{x^2 + x} - 1 \geq 0.$$

Hint: When is the value of a fraction nonnegative?