

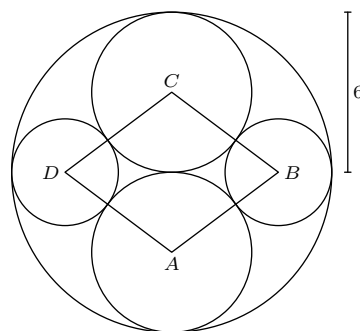
# The Georg Mohr Contest

## Second Round

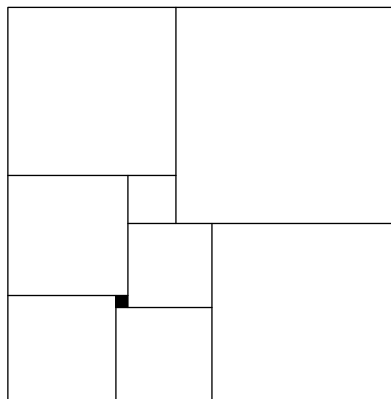
Tuesday 10 January 2012 at 9-13

Aids permitted: only writing and drawing tools.  
Remember that your arguments are important in the assessment.

**Problem 1.** Inside a circle with radius 6 lie four smaller circles with centres  $A$ ,  $B$ ,  $C$  and  $D$ . The circles touch each other as shown. The circles with centres  $A$  and  $C$  touch each other is the centre of the big circle.



Calculate the area of quadrilateral  $ABCD$ .



**Problem 2.** It is known about a given rectangle that it can be divided into nine squares which are situated relative to each other as shown. The black rectangle has side length 1.

Are there more than one possibility for the side lengths of the rectangle?

**Problem 3.** Georg is putting his 250 stamps in a new album. On the first page he places one stamp and then on every page just as many or twice as many stamps as on the preceding page. In this way he ends up precisely having put all 250 stamps in the album.

How few pages are sufficient for him?

**Problem 4.** Two two-digit numbers  $a$  and  $b$  satisfy that the product  $a \cdot b$  divides the four-digit number one gets by writing the two digits in  $a$  followed by the two digits in  $b$ .

Determine all possible values of  $a$  and  $b$ .

**Problem 5.** In the hexagon  $ABCDEF$ , all angles are equally large. The side lengths satisfy  $AB = CD = EF = 3$  and  $BC = DE = FA = 2$ . The diagonals  $AD$  and  $CF$  intersect each other in the point  $G$ . The point  $H$  lies on the side  $CD$  so that  $DH = 1$ .

Prove that triangle  $EGH$  is equilateral.

*Sponsors: Georg Mohr Fonden, Carlsbergs Mindelegat for Brygger J.C. Jacobsen, Dansk Matematisk Forening, Matematiklærerforeningen, Undervisningsministeriet, Gyldendal and Texas Instruments.*