PROBLEM CORNER

Proposed by

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To become a mathematics teacher in a public High School in Spain it is not essential to have a Mathematics B.Sc. degree (it can be a degree on a different scientific discipline) but you do have to achieve, first, a Master degree focusing on relevant pedagogical aspects for pre-service teacher training. Then, you have to pass some public exam (usually called "Oposiciones" by Spanish people), that usually takes place every two years, and it is organized and implemented in each of the Spanish regions (as the development of national education policies is a competence of the different regional authorities, like it happens with the States in the U.S.A.). Obviously, getting prepared and passing the exam is a very relevant task for thousands of young graduate students, that aim to start an professional career as mathematics teachers.

Roughly speaking, the exam includes three parts, where the candidate is asked to:

- give a lecture on the mathematics underlying a certain subject chosen by the examination jury from a publicly announced list, related to the Mathematics Secondary Education Curriculum (e.g. "Limit of functions, notion of continuity, Bolzano's Theorem"),

- to solve some problems, proposed by the jury, of a level corresponding to the first two years of the Bachelor Degree in Mathematics in any of the Spanish Universities, and

- to present and defend a written project dealing with their personal perception of the didactical issues involved in the teaching of mathematics courses in the Secondary Education classroom.

Let us remark that no technological tool (calculator, tablet, laptop, smarthphone, ...) is allowed during the exam, for addressing the proposed problems.

The last of these public "Oposiciones" exams was carried out in June 2021, and among the problems proposed in that call we have chosen two that we find especially attractive, due to their geometric content, and because they allow us to present more than one solution and to discuss some subtle details.

Bearing in mind the restrictions of the "Oposiciones" exam, we have not consider the use of CAS or DGS tools to solve these problems. Yet, we would highly appreciate to receive solutions from the readers of the eJMT Problem Corner that emphasize the potential role of CAS/DGS to solve (fully or partially), explore or extend such problems.

We encourage the readers of the eJMT Problem Corner to attempt solving them, as so many young Spanish candidates to become mathematics teachers ought to do!!
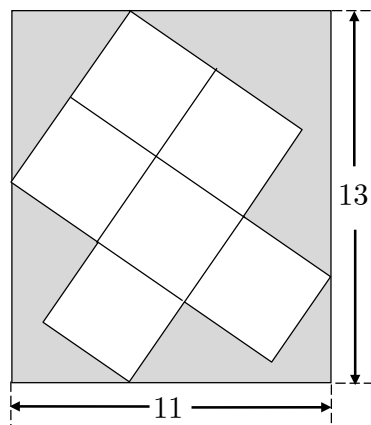
Problem 1

The shaded area of the figure measures 100 cm^2. The two overlapping smaller squares are equal. The side of the larger square is divided into three segments of equal length by the vertices of the smaller squares. Calculate the area of the largest square.
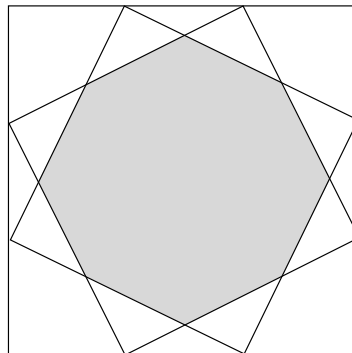
Problem 2

The rectangle in the figure contains six equal squares arranged as indicated. Determine the side of any of these squares.

References

[1] José Manuel Gamboa, Francisco Baena, Braulio de Diego. *Problemas de Oposiciones. Matemáticas*. Tomo 10. Editorial Deimos. (2021) ISBN:= 978-84-86379-98-8