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Center for Discrete Mathematics &
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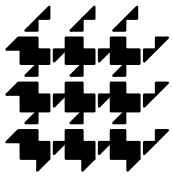

DIMACS EDUCATIONAL MODULE SERIES

MODULE 03-3
Security Cameras and Floodlight Illumination

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Module Description Information

- **Title:**

  Security Cameras and Floodlight Illumination

- **Author(s):**

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  Lidia Luquet

  Allison Wolf

- **Abstract:**

  This module leads students to investigate several geometrical aspects of illumination: the effectiveness of various types of floodlights placed in polygonal rooms either with or without holes as well as problems related to lighting a stage. An optional Section 4 for more advanced students provides formal statements and proofs of some intuitive ideas used in the applications. Exploratory exercises occur throughout the text to encourage students to reflect on new concepts as they are introduced. In addition, more challenging problems are provided.

- **Target Audience:**

  The module is written for advanced high school students and lower level college students.

- **Prerequisites:**

  The prerequisites are high school geometry and proof by mathematical induction.

- **Topics:**

  The topics of this module include security cameras and floodlight illumination of polygons and of stages. The floodlight problems addressed involve determining the maximum of the smallest number of floodlights required to illuminate regions under certain specified restrictions. For example, the floodlights may be required to be placed only at the polygon's vertices and to have the same aperture; the polygons under consideration may be required to have the same number of vertices. Polygons both with and without holes are examined.

- **Goals:**

  One goal is to introduce students to some fundamental ideas of computational geometry through applications to illumination problems. Another goal is promote the idea that mathematics is a growing body of knowledge with easily stated unsolved problems.

- **Anticipated Number of Class Meetings:**

  The module requires three class meetings if Section 4 is omitted; two additional class meetings are needed for Section 4. Advanced students may study the module independently with no class meetings.

- **Contact Information:**

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- **Other DIMACS modules related to this module:**

None at this time