

**BACCALAURÉAT GÉNÉRAL  
ÉPREUVE SPÉCIFIQUE DES SECTIONS EUROPÉENNES  
MATHÉMATIQUES – ANGLAIS**

**SUJET 7**

**Math and nature patterns  
Thème: Geometry**

Ce sujet comporte 2 pages. L'usage de tout modèle de calculatrice, avec ou sans mode examen, est autorisé.

Thus begins "At Breakfast," eight whimsical stanzas about cracking and eating a soft-boiled egg in the Continental manner.

The poem continues: "A smooth miracle here in my hand has it slid/from my sleeve? / The shape/of this box keels me oval." Is there any natural and simple sculpture that pleases the eye and the hand more than a chicken egg? One end of the object is more pointed than the other, and the delightful oval shape varies widely from egg to egg. The shape of a chicken egg can be simulated mathematically by a host of closed curves with different low degree formulas.

The simplest curve is the oval of Descartes, a family of egg-shaped ovals discovered by the 17th-century French mathematician and philosopher. Just as an ellipse can be constructed easily with two pins and a piece of thread, so can certain Cartesian ovals.

Many eminent physicists, including Christian Huygens, James Clerk Maxwell, and Isaac Newton, were fascinated by Cartesian ovals because of their unusual optical properties of reflection and refraction.

Among the many other ovals that resemble eggs, more rounded at one end than the other, are the well-known ovals of Cassini. A Cassini oval is the locus of all points the product of whose distances from two fixed points is a constant.

*Source: Martin Gardner: The Last Recreations: Hydras, Eggs, and Other Mathematical Mystifications.  
1997 Springer-Verlag New York, Inc*

**I. Explain what the text deals with and comment on it.**

**II. Exercise.**

1. Draw a horizontal line segment  $AB=5$  cm
2. Draw the circle with diameter  $AB$ .
3.
  - a. On this circle, place a point  $C$  so that  $BC= 3$  cm.
  - b. What sort of triangle is  $ABC$ ? Explain.
4.
  - a. Construct the point  $D$  that is diametrically opposite  $C$ .
  - b. What type of quadrilateral is  $ADBC$ ? Find its sides and area.