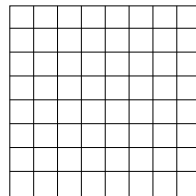


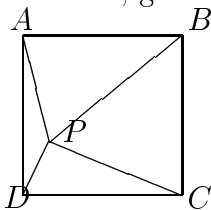
# Geometry

## Rice Mathematics Tournament 2000

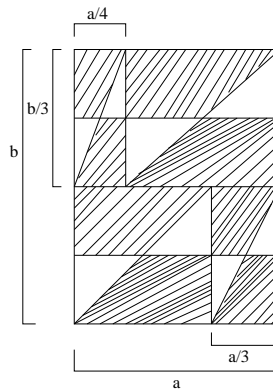
1. How many rectangles are there on an  $8 \times 8$  checkerboard?



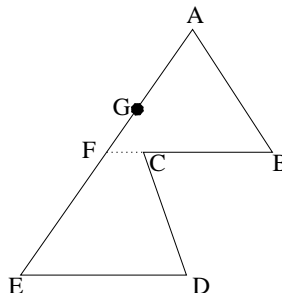
2. In a triangle the sum of squares of the sides is 96. What is the maximum possible value of the sum of the medians?
3. Find  $PB$ , given that  $PA = 15$ ,  $PC = 20$ ,  $PD = 7$ , and  $ABCD$  is a square.



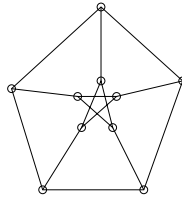
4. Find the total area of the non-triangle regions in the figure below (the shaded area).



5. Side  $\overline{AB} = 3$ .  $\triangle ABF$  is an equilateral triangle. Side  $\overline{DE} = \overline{AB} = \overline{AF} = \overline{GE}$ .  $\angle FED = 60^\circ$ .  $\overline{FG} = 1$ . Calculate the area of  $ABCDE$ .



6. What is the area of the largest circle contained in an equilateral triangle of area  $8\sqrt{3}$ ?
7. Let  $ABC$  be a triangle inscribed in the ellipse  $\frac{x^2}{4} + \frac{y^2}{9} = 1$ . If its centroid is the origin  $(0,0)$ , find its area.
8. A sphere is inscribed inside a pyramid with a square as a base whose height is  $\frac{\sqrt{15}}{2}$  times the length of one edge of the base. A cube is inscribed inside the sphere. What is the ratio of the volume of the pyramid to the volume of the cube?
9. How many hexagons are in the figure below with vertices on the given vertices? (Note that a hexagon need not be convex, and edges may cross!)



10. Let  $C_1$  and  $C_2$  be two concentric reflective hollow metal spheres of radius  $R$  and  $R\sqrt{3}$  respectively. From a point  $P$  on the surface of  $C_2$ , a ray of light is emitted inward at  $30^\circ$  from the radial direction. The ray eventually returns to  $P$ . How many **total** reflections off of  $C_1$  and  $C_2$  does it take?