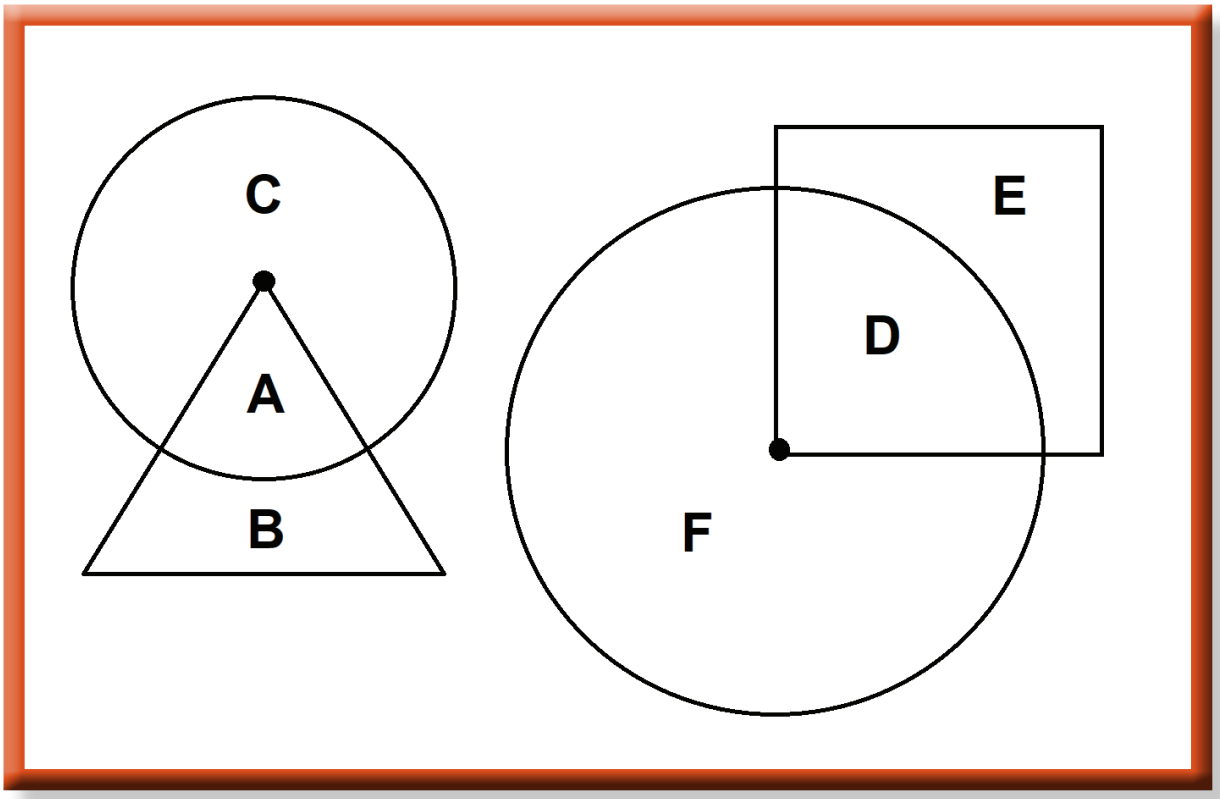
Geometric Puzzle

by Gary S. Flom, MSPE



The area of A = the area of B.
Each side of the triangle = 1 unit.
The center of the circle is at the apex of the triangle.

The area of D = the area of E.
Each side of the square = 1 unit.
The center of the circle is at the lower left corner of the square.

What is the area of F divided by the area of C?

(Solution can be found in the *Solutions* section at the back of this issue.) Ω

Geometric Puzzle: Solution

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To find the area of C:
We first find the area of A, and we then multiply that by 5. This will work because the triangle is equilateral, which means all three of its interior angles are 60 degrees; because the whole circle is 360 degrees, the 60-degree wedge is one-sixth of the circle. To find the area of A, we will use the formula for the area of an equilateral triangle,

which is $\frac{\sqrt{3}}{4}a^2$ (with "*a*" representing one side of the equilateral triangle).

We are told that each side of the triangle equals 1, so the area of the whole triangle is $\frac{\sqrt{3}}{4}$ (square units).

We are also told that the area of A and the area of B are equal, so we know that A is one-half of the area of the whole triangle.

Thus, the area of A is $\frac{\sqrt{3}}{8}$ (square units).

Multiplying A by 5 gives us the area of C, which is $\frac{5\sqrt{3}}{8}$ (square units).

To find the area of F:
We first find the area of D, and then we multiply that by 3. This works because all of the inner angles of a square are 90 degrees; and because the whole circle is 360 degrees, the 90-degree wedge is one-fourth of the circle.

To find the area of D, we first find the area of the whole square with the formula of b x h (base times height). We are told that each side of the square is 1, so the area of the square is 1 (square unit). We are also told that the area of D and the area of E are equal, so we know that the area of D is exactly one-half of the entire area of the square.

So, the area of D is $\frac{1}{2}$ (square units).

Multiplying D by 3 gives us the area of F, which is $\frac{3}{2}$ (square units).

Thus, the area of F divided by the area of C is

$$\frac{F}{C} = \frac{\frac{3}{2}}{\frac{5\sqrt{3}}{8}} = \frac{3}{2} \cdot \frac{8}{5\sqrt{3}} = \frac{12}{5\sqrt{3}} = \frac{12\sqrt{3}}{15} = \frac{4\sqrt{3}}{5}$$ (square units). Ω