



Problem of the Week

Problem C and Solution

Several Grey Areas

Problem

In the diagram, a 6 cm by 6 cm square is formed by arranging 36 identical 1 cm by 1 cm squares in six rows, each of which contains six squares. The large square contains five shaded triangles. How many 1 cm by 1 cm squares must be shaded or unshaded so that exactly half of the area of the large square is shaded?

Solution

We will start by determining the areas of the five shaded triangles. We have labeled the regions A , B , C , D and E . We will calculate the area of each triangle using the formula for the area of a triangle:

$$\text{area} = \frac{\text{base} \times \text{height}}{2}$$

The triangle in region A has base 3 cm and height 2 cm.
The area of this triangle is $\frac{3 \times 2}{2} = \frac{6}{2} = 3 \text{ cm}^2$.

The triangle in region B has base 4 cm and height 2 cm.
The area of this triangle is $\frac{4 \times 2}{2} = \frac{8}{2} = 4 \text{ cm}^2$.

The triangle in region C has base 1 cm and height 3 cm.
The area of this triangle is $\frac{1 \times 3}{2} = \frac{3}{2} \text{ cm}^2$.

The triangle in region D has base 3 cm and height 3 cm.
The area of this triangle is $\frac{3 \times 3}{2} = \frac{9}{2} \text{ cm}^2$.

The triangle in region E has base 2 cm and height 2 cm.
The area of this triangle is $\frac{2 \times 2}{2} = \frac{4}{2} = 2 \text{ cm}^2$.

The total shaded area is therefore $3 + 4 + \frac{3}{2} + \frac{9}{2} + 2 = 9 + \frac{12}{2} = 9 + 6 = 15 \text{ cm}^2$.

We will now determine the area of the entire region. The square is 6 cm long and 6 cm wide. Therefore, the area of the entire square is $6 \times 6 = 36 \text{ cm}^2$.

In order for half of the entire region to be shaded, the shaded area would have to be $36 \div 2 = 18 \text{ cm}^2$. Presently, only 15 cm^2 is shaded so we need to shade an additional 3 cm^2 . That is, we need to shade three additional 1 cm by 1 cm squares.

