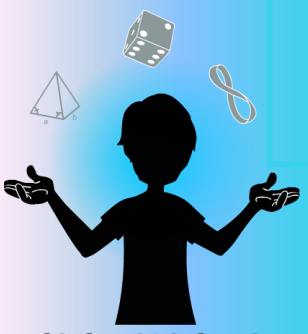


AMAZINGMATHS

PUZZLING CARTOON

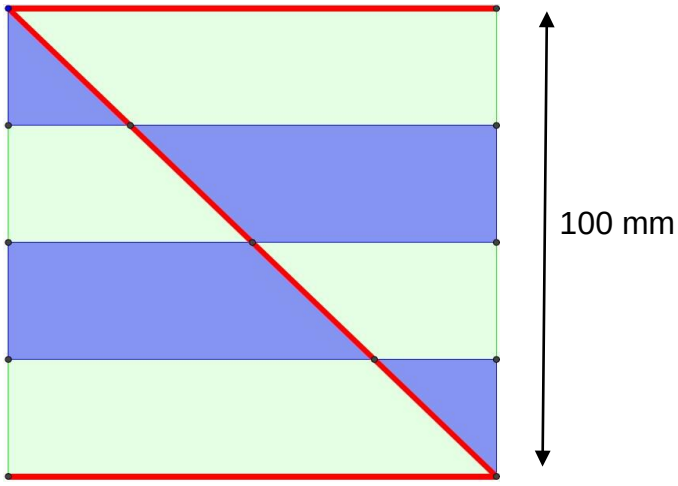
- ZIGZAG -

Materials:

- Video of the puzzle
- Sheets of paper
- Pencils

The puzzle

The owner of the new company ZigZag wants to make coasters of 100mm by 100mm with its logo to advertise. The coasters look like this: we draw the square's diagonal, then we divide the coaster into 4 horizontal stripes of equal dimensions. We add a little bit of colour for the aesthetic and voila. To plan the costs, the company would like to know the area of the blue region.



Can you find the area of the blue surface?

PUZZLE SOLUTION

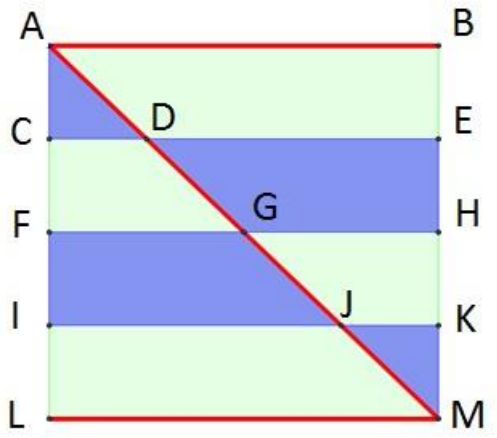
The answer:

Solution 1

We can calculate the sum of the two trapezoids' areas with the height and the mean of the bases, then add the two triangles' areas. It is an accurate solution, but it has more calculations and more chances of making mistakes when we do not use a calculator.

Here are said calculations:

The coaster's side measures 100mm so, each stripe has a height of 25mm.



We will use this annotated figure to ease the identification of the vertexes, the segments and the figures.

Since $\overline{AM}$ is the diagonal of the square, $\overline{CD}$ has the same measurement as $\overline{AC}$. (To be sure, we can use the fact that the diagonal has an angle of 45 degrees with the side, so the angle CAD measures 45 degrees. Since the angle ACD is right and the sum of the internal angles of a triangle is 180 degrees, then the angle ADC also measures 45 degrees, thus the triangle is isosceles.)

We can directly calculate

Area(ΔACD) = $(25 * 25)/2$ = 312,5 mm^2.

Since m($\overline{CD}$) = 25mm, we deduce that m($\overline{DE}$) = 75mm.

Plus, because $\overline{AM}$ is the diagonal, we deduce that m($\overline{GH}$) = m($\overline{BH}$) = 50mm.

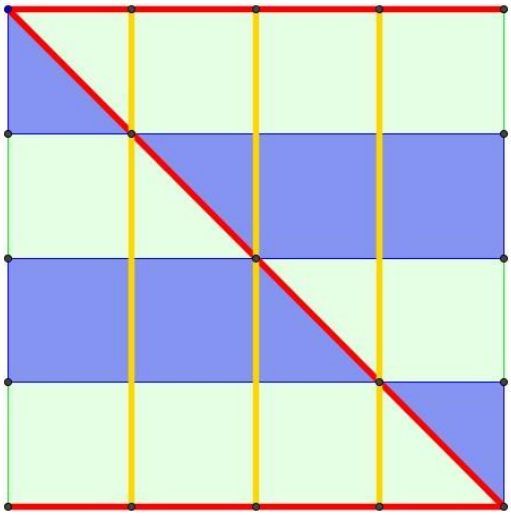
We calculate Area(DEHG) = $((75 + 50)/2) * 25 = 1562{,}5$ mm^2.

We will find with analogous calculations Area (FGJI) = 1562,5 mm^2 and Area(JKM) = 312,5 mm^2.

In total, the blue region has an area of 312,5 + 1562,5 + 1562,5 + 312,5 = **3750 mm^2**.

Solution 2

To illustrate the second solution (easier), let's add a few lines on the drawing:



There are 16 squares, the triangles form half squares. The total area of the blue region then is $4 * \frac{1}{2} square + 4\ squares = 6\ squares$.

Therefore, the area of the blue region is $\frac{6}{16} * total\ area = \frac{3}{8} * (100^2) = 3750 mm^2$

OR (without fractions)
The area of the blue region is 6 squares of 25mm by 25mm, that is $6*625\ \text{mm}^2 = 3750\ \text{mm}^2$

Answer: 3750 mm^2