PUZZLING CARTOON

- LANDSCAPING -

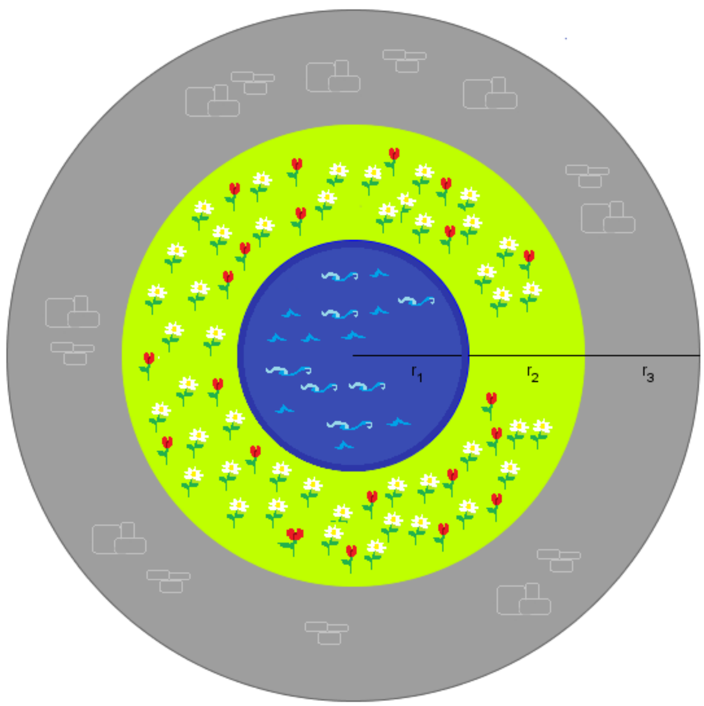
AMAZINGMATHS

Materials:

- Video of the puzzle
- Sheets of paper
- Pencils

The puzzle

The town of Mathville decides to call on an urban planner to design the public square in front of the town hall. The square is circular and looks like this right now. Not very inspired, the urban planner suggests a layout to which we added a zone with flowers, also circular. The mayor is slightly disappointed, but luckily, a mysterious benefactor donates a circular fountain to place in the centre of the layout, which then looks like this. The fountain's radius measures exactly a third of the total radius. The strip of flowers and the strip of stones are the same width. The total area of the layout is 114 square metres.



To help plan the project, we have to determine the area of the flower zone. Can you do it?

PUZZLE SOLUTION

The answer:

First solution:

Step 1: Finding the big circle's radius. (r)

$$\pi r^2 = 114 \ \rightarrow r = \sqrt{\frac{114}{\pi}}$$

Step 2: Setting the medium circle's radius as 2/3 of the big radius and finding the medium circle's area.

Since the fountain's radius is equal to a third of the big radius, and that the two strips are the same width, the medium circle's radius (strip of flowers + fountain) is 2/3 of the big circle's radius. The radii are then (1/3)*r for the fountain, (2/3)*r for the fountain and the flowers and (3/3)*r=r for the whole space, meaning the fountain, the flowers and the stones.

$$\pi\left(\frac{2}{3}r\right)^2 = \left(\frac{2}{3}\right)^2\left(\sqrt{\frac{114}{\pi}}\right)^2 * \pi = \frac{4}{9} * 114$$

Step 3: Subtracting the small circle's area. ($\pi(\frac{1}{3}r)^2$)

$$\frac{4}{9} * 114 - \pi\left(\frac{1}{3}r\right)^2 = \frac{4}{9} * 114 - \left(\frac{1}{3}\right)^2\left(\sqrt{\frac{114}{\pi}}\right)^2 * \pi = \frac{4}{9} * 114 - \frac{1}{9} * 114 = \frac{3}{9} * 114$$

$$A = \frac{1}{3} * 114 = 38$$

The zone has an area of **38 m^2**.

Second solution:

We consider that the big circle has a radius of 3r, the medium one a radius of 2r and the smaller one a radius of r.

The areas are given, respectively, by the following equations:

$$A_b = \pi(3r)^2 = 9\pi r^2$$
$$A_m = \pi(2r)^2 = 4\pi r^2$$
$$A_s = \pi(r)^2 = \pi r^2$$

We are trying to find the proportion that represents the area of the strip of flowers in comparison with the big circle's area.

$$A_{flowers} = A_m - A_s = 4\pi r^2 - \pi r^2 = 3\pi r^2$$
$$\frac{A_{flowers}}{A_b} = \frac{3\pi r^2}{9\pi r^2} = \frac{1}{3}$$
$$A = \frac{1}{3} * 114 = 38$$

The zone has an area of **38 m^2**.