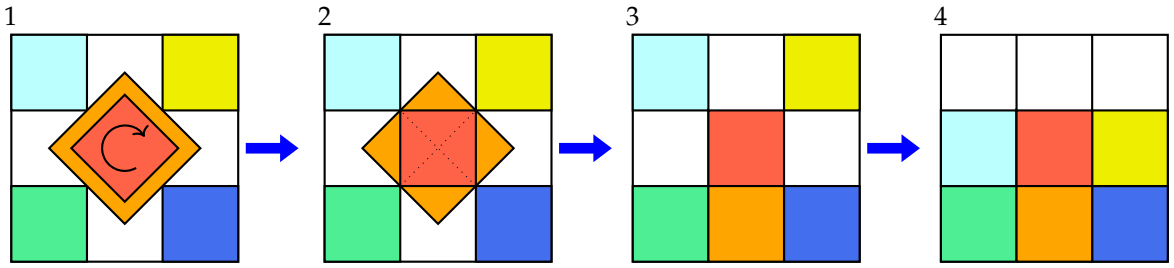
Here are the full, or partial solutions.

Year 8 and below

A Pattern of squares. All six coloured areas are equal. What fraction is shaded?

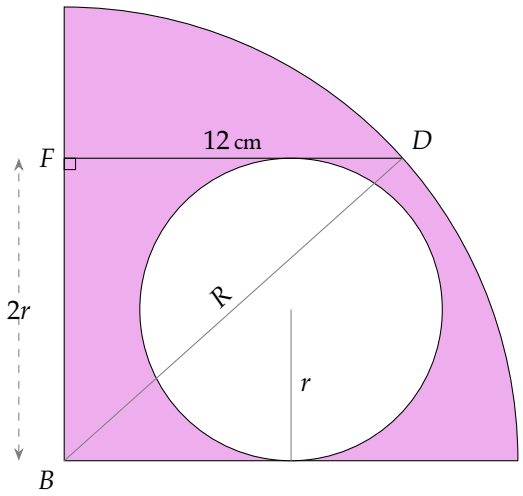


Solution

See the diagrams above.
Since the red square has the same area as the orange area, we can rotate the red square as shown in the second diagram, and rearrange the orange area such that the orange triangles fit exactly into the red triangles indicated by the dotted diagonal lines.
We have shown that the width and height of the unshaded areas are the same as the width and height of the shaded squares.
So we can fill the bottom, middle square exactly with the orange triangles (Diagram 3).
Moving the cyan and yellow squares down (Diagram 4), we see that $\frac{2}{3}$ of the diagram is shaded.

Year 9 and above

Find the shaded area.



Solution

There doesn't seem to be enough information given to be able to solve this! Yet...
Shaded area A= area of the quadrant - area of the circle.

$$A = \frac{\pi R^2}{4} - \pi r^2$$

In $\triangle BDF$, we can apply Pythagoras' Thm.:

$$R^2 = (2r)^2 + 12^2$$

$$r^2 = \frac{R^2 - 144}{4}$$

Substituting:

$$A = \frac{\pi R^2}{4} - \pi\frac{R^2 - 144}{4}$$

$$A = \frac{\pi R^2}{4} - \frac{\pi R^2}{4} + 36\pi$$

$$A = 36\pi \approx 113.097\,\text{cm}^2$$

The unknowns just vanish, isn't that marvellous?! Notice the radius of the shaded quadrant is not fixed, as long as the chord tangent to the inner circle is 12 cm, R and r change so that the shaded area remains 36π.