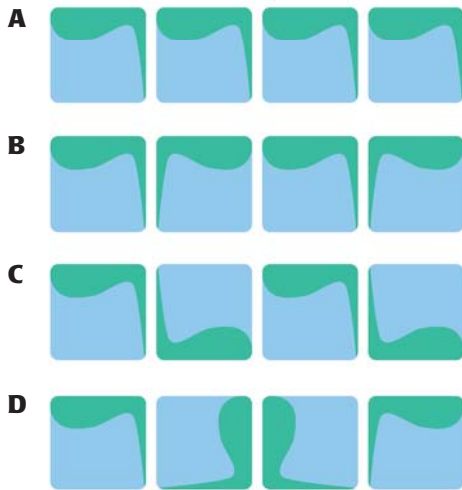


TRANSFORMATION PROBLEMS ON TAKS

Below are examples of transformation problems in multiple choice format. Try solving the problems before looking at the solutions. (Cover the solutions with a piece of paper.) Then check your solutions against the ones given.

1. Borders on a bathroom wall can be created using transformations of a tile. Which border is created using a translation and a rotation of the previous tile in the pattern?



2. To produce a fractal called the *Cantor set*, start with a line segment having a length of 1 unit. In each iteration, perform the following steps for each line segment resulting from the previous iteration.

Step 1: Divide the line segment into 3 equal segments.

Step 2: Remove the middle segment.

What fraction of the 1-unit line segment remains after the third iteration?

- F** $\frac{1}{27}$
- G** $\frac{8}{27}$
- H** $\frac{1}{3}$
- J** $\frac{4}{9}$

Solution

The tile pattern in choice A uses only translations to create the border.

The tile pattern in choice B uses only reflections to create the border.

The tile pattern in choice C uses translations and rotations to create the border. Each tile is a translation and a rotation of the previous tile.

The tile pattern in choice D uses translations, rotations, and reflections to create the border.

The correct answer is C.

(A) **(B)** **(C)** **(D)**

Solution

Draw the Cantor set. Label the length of each line segment after the iteration.

	1	Iteration 0
	$\frac{1}{3}$	Iteration 1
	$\frac{1}{9}$	Iteration 2
	$\frac{1}{27}$	Iteration 3

Find the total length remaining after the third iteration by multiplying the length of each segment by the number of segments.

$$\frac{1}{27} \cdot 8 = \frac{8}{27}$$

The correct answer is G.

(F) **(G)** **(H)** **(J)**