10 TAKS PREPARATION

REVIEWING TRANSFORMATIONS

A *transformation* is an operation that maps, or moves, a given figure onto a new figure. The original figure is the *preimage*, and the new figure is the *image*.

> ## Types of Transformations
>
> A *reflection* uses a line called the line of reflection that acts like a mirror. A preimage is reflected across the line to produce the image.
>
> A *rotation* turns a preimage about a fixed point, called the center of rotation.
>
> A *translation* moves every point of a preimage the same distance and in the same direction.
>
> A *dilation* is a reduction or enlargement of a preimage by a scale factor k.

Tessellations and fractals are mathematical figures that can be produced using transformations. A *tessellation* is a collection of tiles that fill a plane with no gaps or overlaps. A *fractal* has the property of self-similarity: a part of the figure resembles the whole figure, so that the part is a dilation of the whole. Many fractals can be formed by a repetitive process called iteration.

EXAMPLE

A *Koch snowflake* is a fractal created by starting with an equilateral triangle that has a side length of 1 unit. In each iteration, a new equilateral triangle is placed on the middle third of every side of the Koch snowflake. What is the perimeter of the Koch snowflake after the second iteration?

Solution

Draw the first few iterations of the Koch snowflake. Label the length of each side. Find the perimeter by multiplying the number of sides by the length of each side.

Iteration 0   Iteration 1   Iteration 2
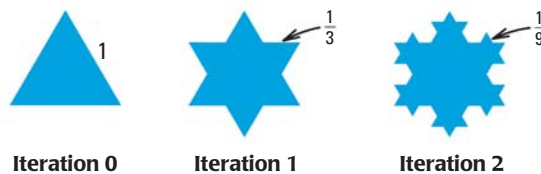
Iteration	0	1	2
No. of sides	3	12	48
Perimeter	$3 \cdot 1 = 3$	$12 \cdot \frac{1}{3} = 4$	$48 \cdot \frac{1}{9} = \frac{16}{3}$

▶ The perimeter of the Koch snowflake after the second iteration is $\frac{16}{3}$ units.