Frieze Patterns

- **Goals** Use transformations to classify frieze patterns.
 - Use frieze patterns to design border patterns in real life.

VOCABULARY

Frieze pattern A frieze pattern is a pattern that extends to the left and right in such a way that the pattern can be mapped onto itself by a horizontal translation.

Border pattern Frieze patterns are also called border patterns.

Example 1

Describing Frieze Patterns

Describe the transformations that map the frieze pattern onto itself.







Solution

- a. This frieze pattern can be mapped onto itself by a horizontal translation (T) or by a horizontal glide reflection (G).
- b. This frieze pattern can be mapped onto itself by a horizontal translation (T) or by a reflection in a vertical line (V).
- c. This frieze pattern can be mapped onto itself by a horizontal translation (T) or by a 180° rotation (R).

Checkpoint Describe the transformations that map the frieze pattern onto itself.

^{1.} 7₂7₂7₂7₂7₂7₂7₂

Translation; horizontal glide reflection

CLASSIFICATION OF FRIEZE PATTERNS							
Т	Translation	9	9	9	9	9	9
TR	Translation and 180 $^{\circ}$ rotation	9	6	9	6	9	6
TG	Translation and horizontal glide reflection	9	9	9	3	9	•
TV	Translation and vertical line reflection	9	•	9	•	9	•
THG	Translation, horizontal line reflection, and horizontal glide reflection	9	?	?	9	?	9
TRVG	Translation, 180° rotation, vertical line reflection, and horizontal glide reflection	9	•	9	6	9	•
TRHVG	Translation, 180° rotation, horizontal line reflection, vertical line reflection, and horizontal glide reflection	2	6	2	6	9	6

Example 2 Classifying a Frieze Pattern

Native Americans Categorize the band pattern in the Native American headdress.

Solution

The pattern is a TRHVG.



Checkpoint Classify the frieze pattern.



TRHVG

Example 3 Drawing a Frieze Pattern

Tiling A border on a floor is created using the tile shown at the right. The border pattern is classified as TV. Draw one such pattern.



Solution

Begin by reflecting the given tile vertically. Use this tile and the original tile to create a pattern that has a vertical line of symmetry. Then translate the pattern several times to create the frieze pattern.



- **Checkpoint** Complete the following exercise.
 - **3.** Use the tile in Example 3 to draw a pattern that can be classified as TG.

Sample Answer:

