

Identifying Frieze Patterns Exploration

Objective: Become familiar with identifying border patterns as well as creating them.

Notation: You may use the notation in the text, or use this notation:

The border patterns can be given fairly simple names consisting of 2 symbols. The first symbol is either 'M' or '1', depending on if the border pattern has a vertical line of symmetry. The second symbol is 'M', 'G', '2' or '1', depending on what other symmetries are present. (This notational system is derived from these meanings: M designates a mirror symmetry, G a glide-reflection symmetry, 2 a 2-fold rotation symmetry, and 1 the absence of a symmetry.)

Determining the symmetry group can then be accomplished by following this set of questions (we assume that the border patterns run from the left to the right, so that the terms horizontal and vertical are unambiguous):

First symbol: Are there vertical lines of reflection?

Yes -> the symmetry group starts with M.

No -> the symmetry group starts with 1.

Second symbol: Is there a horizontal line of reflection?

Yes -> the symmetry group ends with M.

No -> next question

Is there a glide-reflection symmetry?

Yes -> the symmetry group ends with G.

No -> next question

Is there 2-fold rotational symmetry?

Yes -> the symmetry group ends with 2.

No -> the symmetry group ends with 1.

The correspondence between this system and the one in the text (the IUC notation) is as follows:

1M = p1m1

1G = p1a1

12 = p112

11 = p111

MM = pmm2

MG = pma2

M1 = pm11

Questions

1. What is the symmetry group for the following border pattern: ...
FFFFFFFFFFFFFFFFFFFFFFFF...

2. You can form all 7 border patterns if you start with F. Show the other 6.

3. What is the symmetry group for the following border pattern: ...
BBBBBBBBBBBBBBBBBBBB...

4. You can form all 7 border patterns if you start with B. Show the other 6.

5. What is the symmetry group for the following border pattern: ...
OOOOOOOOOOOOOOOOOO ...

6. You can form all 7 border patterns if you start with O. Show the other 6.