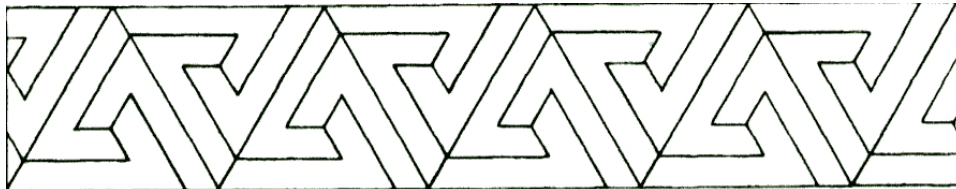


1. The following are frieze patterns. On each one, indicate the following with colored ink:
- The shortest translation, τ , that preserves the pattern.
 - All points of symmetry (i.e., all points P for which $\rho_{P,\pi}$ is in the frieze group, \mathcal{F}).
 - All vertical lines of symmetry (i.e., all vertical lines n such that $\sigma_n \in \mathcal{F}$).

(a) WOIOM OIOWOIOM

- (i) Is there a horizontal line of symmetry?
(ii) Is there a glide reflection whose square is τ ?
(iii) Which of the seven listed groups is \mathcal{F} ?

(b)



- (i) Is there a horizontal line of symmetry?
(ii) Is there a glide reflection whose square is τ ?
(iii) Which of the seven listed groups is \mathcal{F} ?

(c)

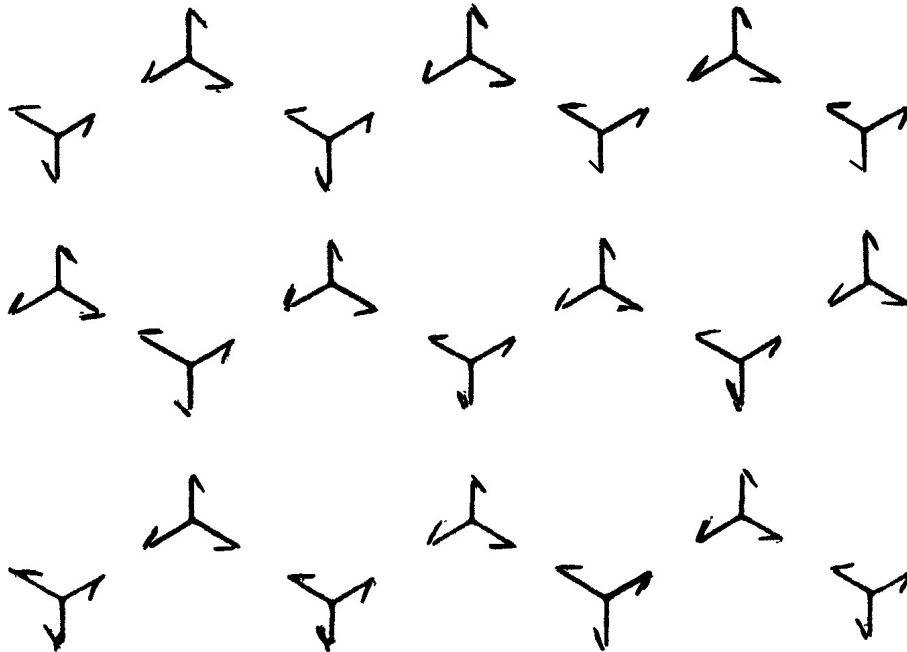


- (i) Is there a horizontal line of symmetry?
(ii) Is there a glide reflection whose square is τ ?
(iii) Which of the seven listed groups is \mathcal{F} ?

2. The following are wallpaper patterns. On each one, indicate the following with colored ink:

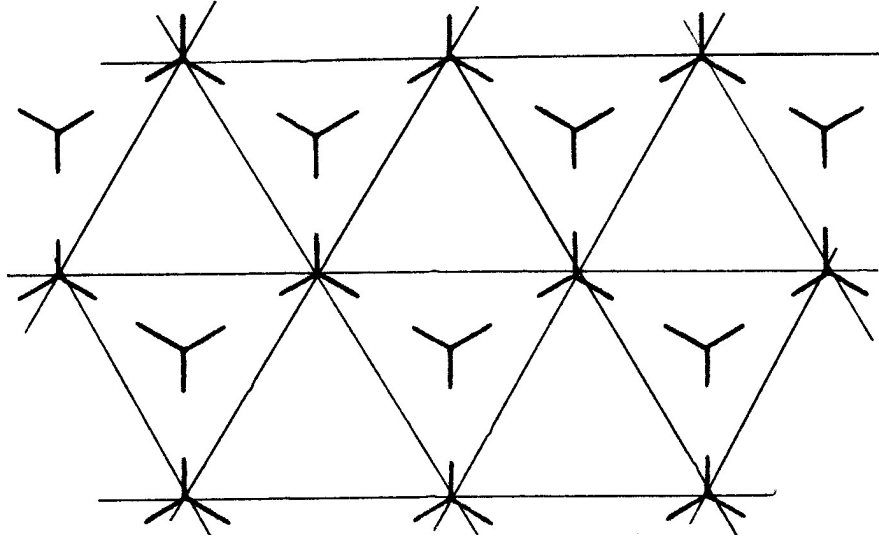
- A rhombic fundamental region for the action of the translation subgroup \mathcal{T} of the wallpaper group \mathcal{W} for this pattern. (The sides of the rhombus are shortest translations in \mathcal{W} .) If there are 6-centers for this pattern, use them for vertices of this region. Otherwise place the vertices at 3-centers.
- The 3-centers that lie in the fundamental region.

(a)



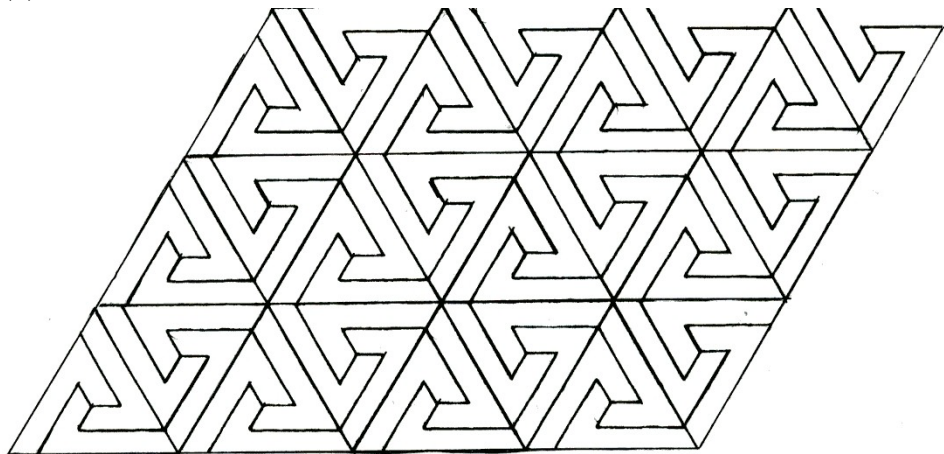
- Which of the diagonals (long, short or both) of the fundamental region are lines of symmetry for the pattern?
- Which of the listed wallpaper groups is \mathcal{W} ?

(b)



- (i) Which of the diagonals (long, short or both) of the fundamental region are lines of symmetry for the pattern?
- (ii) Which of the listed wallpaper groups is \mathcal{W} ?

(c)



- (i) Which of the diagonals (long, short or both) of the fundamental region are lines of symmetry for the pattern?
- (ii) Which of the listed wallpaper groups is \mathcal{W} ?